University of Helsinki teachers as users and adopters of change of web-based learning environments in teaching

Helsinki 2014

Research report 355

Anni Rytkönen

University of Helsinki teachers as users and adopters of change of web-based learning environments in teaching

Academic dissertation to be publicly discussed, by due permission of the Faculty of Behavioral Sciences at the University of Helsinki, in the Festival Hall at the Language Centre, Fabianinkatu 26, 3rd floor, on Monday, June 2nd 2014, at 12 o´clock

Helsinki 2014

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Anni Rytkönen

Helsingin yliopiston opettajat verkko-oppimisympäristöjen käyttäjinä ja vaihtajina

Tiivistelmä

Suomalaisissa yliopistoissa verkko-oppimisympäristöt tarjotaan opettajille keskitetysti ylläpidettyinä palveluina. Tekninen kehitys ja järjestelmien rajalliset elinkaaret aiheuttavat painetta järjestelmien valintaan ja vaihtoon aika ajoin. Näin tapahtui myös Helsingin yliopistossa kun Blackboard vaihdettiin Moodleen vuosina 2008-2011. Opettajat, jotka olivat tottuneet käyttämään yhtä järjestelmää, joutuivat vaihtamaan toiseen järjestelmään. Tämä vaihtoprosessi oli tausta tutkimukselleni, jonka päätavoite oli selvittää, miten opettajat käyttävät opetusteknologiaa opetuksessaan ja miten he omaksuvat järjestelmien vaihdon Helsingin yliopistossa. Tavoitteisiin pääsemiseksi määriteltiin neljä päätutkimuskysymystä:

1. Miten Helsingin yliopiston opettajia voidaan kuvailla teknologian käyttäjinä opetuksessaan?
2. Mihin kokeneet käyttäjät keskittävät huomionsa teknologian opetuskäytössä?
3. Miten opettajat käyttävät teknologiaa opetuksessaan?
4. Miten käyttäjät omaksuvat opetuksessa käytettävän teknologian muutoksia?

Käyttäjien kokemuksia kerättiin kyselyin, joihin tuli yhteensä 697 vastausta, ja haastatteluin, joita oli 11, vuosien 2008 ja 2011 välisenä aikana. Kerätty aineisto analysoitiin hyödyntäen määrällisiä ja laadullisia menetelmiä.

Tulosten perusteella verkko-oppimisympäristöjen käyttö Helsingin yliopistossa oli suurelta osalta yksinkertaista, kuten materiaalinjakelua. Pedagogisesti mielekkäiden menetelmien, kuten ryhmätyön tarpeita korostettiin vähäisesti. Haastateltujen, edistyneiden käyttäjien osaamista kuvasi joko painottuminen teknologiaan tai pedagogiikkaan, tai pedagogisista lähtökohdista valittujen, teknisesti edistyneiden menetelmien käyttö.

Opettajat olivat pääsääntöisesti tyytyväisiä heille tarjottuihin järjestelmiin, mutta tuloksissa kuvatut Blackboardin tekniset ongelmat perustelivat hyvin Helsingin yliopiston päätöksen luopua siitä ja siirtyä Moodleen.

Opettajat vaihtoivat opetuksessaan verkkovälineestä toiseen kahdella päästrategialla: joko reippaasti mahdollisuuden tultua ja lähinnä työskennellen itsekseen, tai mahdollisimman myöhään ja mielellään muiden neuvoja tai tukea hyödyntäen. Uuden välineen omaksumisprosessiin liittyvät tulokset osoittivat lisäksi puutteita opetukseen liittyvän päätöksenteon ja opetusteknologian systemaattisen käytön tuessa laitos- ja tiedekuntatasoilla. Opettajat kokivat tekevänsä enemmän itsenäisiä päätöksiä kuin olisivat halunneet. Opetusteknologian suositukset, valinnat ja järjestelmien vaihdot tulisi muistaa huomioida opetuksen kokonaisvaltaisen tuen ja kehittämisen osana sen sijaan, että sitä pidetään vapaaehtoisena lisänä siitä kiinnostuneille. Siksi opetusteknologian systemaattiseen suunnitteluun ja sen tukeen tulisi keskittyä vieläkin enemmän ja nimenomaan laitostason prosessein ja johdon tuella.

Avainsanat: suomalainen yliopisto-opetus, opetus ja oppiminen, opetusteknologia, verkko-oppimisympäristöt, opettajat teknologian käyttäjinä, innovaation käyttöönotto

University of Helsinki
Faculty of Behavioral Sciences
Department of Teacher Education
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Abstract

Web-based learning environments are provided for Finnish university teaching personnel as centrally maintained systems. Technical development and system life cycles put pressure on the selection and changing of systems at regular intervals. This was what happened at the University of Helsinki when Blackboard was changed to Moodle between 2008 and 2011. Teachers who were used to using one system were asked to change to another one. The change process was the context for the present study, with the main goal of determining what the process of adopting another web-based learning environment would reveal from teachers as users and adopters of educational technology at the University of Helsinki. To reach the goals, four main research questions were defined as

1. How can University of Helsinki teachers be described as users of technology in teaching?
2. What do experienced users focus their thinking on in using technology in teaching?
3. How do the teachers utilize technology in teaching?
4. How do users adopt changes in technology used in teaching?

Data was collected with four questionnaires, including altogether 697 responses, and with 11 interviews between 2008 and 2011, and was analyzed using a mixed methods approach.

The results illustrated the majority of casual use of web-based learning environments. Further, simple web-based methods such as distributing materials were largely used instead of pedagogically more meaningful methods such as group work. Interviewed, experienced users expressed expertise that was balanced toward either technology or education or illustrated pedagogically motivated and technologically advanced thinking. Teachers expressed two major strategies in adopting new educational technology: as soon as possible by typically working on their own or as late as possible, typically with an interest in a variety of interpersonal methods. The adoption process additionally illustrated the lack of organizational support in decision-making and the systematic use of educational technology in many faculties. Teachers perceived that they were more on their own than they would have wanted. Recommending, selecting, and changing educational technology should be seen as part of overall teaching support and development instead of additional and voluntary fun for the motivated ones. Therefore, support in teaching design using educational technology should be focused on more in department-level processes and department management support.

Keywords: Finnish Higher Education, teaching and learning, educational technology, web-based learning environments, teachers as users of technology, adoption of an innovation

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Making this PhD has been a long journey, with a number of supervisors, employers and faculties. Now, as the end is finally getting close, I want to remember and thank all the participants who have made it possible.

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I started my PhD studies at the department of Computer Science in 2003 because “you cannot work at the university without taking the PhD”. My first supervisor, professor Matti Nykänen, thank you for supporting and encouraging me in my multidisciplinary direction and designing the Plan B with me – as it turned out, the plan came to good use! My mentor, Senior Lecturer in University Pedagogy Taina Kaivola, thank you for all the encouragement and spirit, I always felt enlightened after our sessions. Professor and Head of Department for Teacher Education Jari Lavonen, I am so grateful for accepting me as a PhD student in the Faculty of Behavioral Sciences at such a late stage with a number of credit units, and for bringing the long journey safely to the end.

The thesis would not have been possible without my employer, University of Helsinki, who made the decision to evaluate the used learning environment systems and reduce the used alternatives. Though I conducted the research in my own time, the context which provided me the opportunity to select the subject was essential. My colleagues Olli Salo and Mari Jussila who started the process in which I joined later, thank you for sharing the data and knowledge in the process. All my informants, the thesis would not be here without you! Especially, I would like to thank my eleven interviewees who provided me with such valuable information. This book would not look as polished without some help; thanks to Kristiina Karjalainen for your support in all lingual matters beyond Scribendi, and Päivi Nietosvaara for technical support with the layout.

Writing this study has been one of my hobbies since 2006. I have not had a research group to collaborate with, and computer scientists with focus on educational technology are not that many. Therefore, peers to discuss the topic have been most essential and valuable. Pasi Silander, I want to thank you so much for all the discussions, peer coaching and difficult questions through the years and especially during the pre-examination process. I truly think the manuscript developed through our communication. Teaching at the Department of Computer Science provided me with wide experiences and expertise with a variety of web-based learning environments that I perceive has given insight in the genre, in collaboration with active, open-minded and educative students and personnel who I remember with warmth. Sometimes even drawing lines between fields of science was needed. The national 'Kehittäjää etsimässä' workshop in 2009 made me set goals and enhanced the restart of writing this thesis. Thank you for that, Mari and Merja! My colleagues at the Educational Technology Centre; thank you for making it possible for me to take study leave when I needed it and taking care of all the work during my absence – and for being such lovely colleagues!

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In Tervamäki, on the not-so-sunny 3 May 2014

Anni

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1 Introduction

Educational institutions have provided a variety of technologies for educational purposes for years, some for decades. Development in technology has made it necessary every now and then to replace systems and equipment with new ones because of bygone generations of technical solutions and ended supplier support. The development of pedagogical needs, technology, and strategic goals all together motivate the decisions concerning the selection of used systems. This was the case at the University of Helsinki in 2006 when the rector called together a working group (Lavonen, Aunesluoma, Kirkinen, Helin, Joutsenvirta, Laine, Nevgi, Pusa, Romanov, & Sihvonen, 2006) to prepare guidelines in providing the primary system for educational purposes. When making such decisions, issues to take into account include:

- Technological innovations and development with software lifecycle and alternatives provide the frames for the educational technology design (Lavonen et al., 2006; Ruohotie, 1996). Sometimes they put pressure on faster development than wanted on educational purposes, and sometimes it is not possible to implement systems the way they were pedagogically motivated because of technical restrictions.
- The systems are used for educational purposes, so educational needs based on educational research are emphasized, and the educational approach should be the leading perspective in decisions made (Lavonen et al., 2006).
- End-users'—teachers' and students'—experiences, opinions, and needs, where stability is hoped for, should be listened to, according to user-centered system design principles (Nielsen, 1993).
- The decisions must be in line with overall organizational development, strategies, and values that change and develop (Ruohotie, 1996).

Motivated decision-making followed by ratification of the decisions are the basis of goal-oriented development, and they should be kept in balance in spite of the possible contradictions between the listed issues. This observation of the situation motivated the subject of the present study, where the context was Finnish Higher Education at the University of Helsinki. To deepen knowledge on teachers as users of web-based learning environments and their orientations to change, the context of changing technology (Koski-Kotiranta & Salo, 2008a, 2008b; Lavonen et al., 2006) was selected.

Pedagogical and technological development with actions distributed from organizational decisions to working community practices affect teachers' work as added value and costs, i.e. increased ease of effort and caused expenses (Kotler, 2000). The consequences of the development work were within the scope of this study—teachers' perceived experiences of provided systems with values and expenses for teaching. This teacher perspective can further be reflected to the provided system as one more development phase: what system characteristics benefit the *presented groups of teachers* in their work to result in the intended pedagogical use.

In usability research (e.g., Nielsen, 1993), it is typical to study on users in using a system and compare system properties against each other. Users are observed in using a system to gain insight on user thinking and working processes when aiming at a goal. In this study, however, the additional clue lies in the chain: one end-user, the teacher, makes another end-user, the student, use the selected system. Teachers should be able to design their use of technology such that it supports the students in their learning processes. This, in turn, indicates that the teacher should have capabilities in design and awareness of the system's instructive role as well.

Just as in starting to use technology in teaching besides face-to-face methods, the received values to motivate users, share knowledge, and develop education should be pointed out when justifying a change in systems. To deepen knowledge of the suitability of the used technology for end-users' purposes, the situation of change was investigated from the teacher's perspective. The teacher's personal perspective was selected to enhance the end-user experiences, opinions, and opportunities in the educational development process. Additionally, it was considered essential, so the student end-user perspective was left out of this study.

To reach the goals, the following research questions were formulated:

5. How can University of Helsinki teachers be described as users of technology in teaching?
6. What do experienced users focus their thinking on in using technology in teaching?
7. How do the users utilize technology in teaching?
8. How do users adopt changes in the technology used in teaching?

The questions were approached with triangulation in data collection methods with questionnaires, interviews added by system log data, and a mixed methods analysis approach with quantitative and qualitative data analysis methods. The results of the study are expected to provide information and models that deepen used theories and increase understanding of university personnel in using and changing technology used in their teaching at the University of Helsinki. This kind of knowledge on teacher actions is needed for strategic decision-making and educational development at university level.

The author’s position to the subject was originally the change process project manager 2009-2011 at Educational Technology Centre, responsible for the schedule and design of the actions. Thus, the study interest was work-related, and the study focus, design and data analysis were by the author. The surveys used in the study were designed and collected as parts of the process during 2008-2009 together by the IT services and Educational Technology Centre for the design and support of the change process. The first survey was designed by Olli Salo, the second survey by Mari Jussila and the third survey by the author. The interviews were all designed, interviewed and transcribed by the author.

The abstraction hierarchy of pedagogical concepts in this study goes top-down from goals to methods to implementation. If the *goal* is the target to aim for, *methods* are the processes that are used in reaching the goal. To emphasize the practical nature, the concept of *working method* is used to illustrate the actions teachers and students take when teaching and studying. These could also be called teaching and learning activities (Biggs & Tang, 2011, pp (97-100). But methods do not necessarily take stand to how they are implemented. Instead, for each working method, such as group work, taking exams, or lecturing, there can be different *implementation* alternatives, with or without technology. For example, group work could be implemented with a combination of a wiki, a discussion forum and face-to-face group meetings, an exam taken in a classroom, and lectures given via an online conferencing system. Thus, *web-based* and *face-to-face* (working) methods are subgroups of working methods and can be combined based on teacher-defined goals. Therefore, the implementation that supports reaching the goals can consist of different combinations of face-to-face and web-based methods for students.

The presented abstraction hierarchy provides the context and structure for the theoretical background in this thesis. The pedagogical goals, providing the motivations for teaching and learning activities, are presented in Chapter 2 with the main theoretical background from Biggs’ (2003, pp. 11-33; Biggs & Tang, 2007; Biggs & Tang, 2011) teaching and learning approaches and Paavola and Hakkarainen’s (2005) learning approaches. Chapter 3 illustrates methods including technology, discussing their benefits and presenting usability theories by Nielsen (1993). Various technological alternatives are the focus of Chapter 4. The pedagogical and technological parts combined build the base for using technology in teaching in faculties and departments where they are first learned and then taken into educational use. There, the theory on the diffusion of innovations by Rogers (2003) is presented with applications, and the theoretical background for this thesis is addressed in Chapter 5. The research goals and questions for this study are presented in Chapter 6. Chapter 7 describes the research methods used, followed by the results discussed in the order of research questions in Chapter 8. The discussion in Chapter 9 summarizes the thesis. The appendices include a list of used web-based learning environments in Finnish Higher Education as well as the survey questionnaires and interview themes used in the study.

2 Approaches to teaching and learning

In this chapter, approaches to teaching and learning are discussed, using a framework used at University of Helsinki in courses and applied in research on university pedagogy and thus familiar to the University of Helsinki target group. Theories presented in this chapter are also applied in this study. When investigating teachers as users of technology in teaching, this chapter provides information on the pedagogical motivations of the decisions and actions.

Students have their own personal approaches to learning, just as teachers have theirs on teaching. An *approach* is the perspective that a person has with awareness or unconsciously concerning a subject—what the person thinks the subject is (Biggs, 2003, pp. 11-19). For example, teachers' approaches to teaching are expected to illustrate how they teach (Postareff & Lindblom-Ylänne, 2008).

John Biggs (Biggs, 2003, pp. 14-17; Biggs & Tang, 2007, pp. 22-27; Biggs & Tang, 2011, pp. 24-28) describes s*tudents' approaches to their learning* at two levels: a deep and surface approach. The ideal for students would be to have a *deep approach* to their learning (see also Lindblom-Ylänne, Mikkonen, Heikkilä, Parpala, & Pyhältö, 2009). That would aim at meaningful engagement in learning tasks, i.e. meaningful learning. Meaningful learning, in turn, is described as collaborative, constructive, and reflective with personal context creation and includes the student's own activity with intentionality of personal learning goals (Jonassen, 1995; Lavonen et al., 2006; Löfström & Nevgi, 2007b).

A deep approach to learning is based on the constructive learning theory (Biggs, 1996; Biggs & Tang, 2007, pp. 20-21; Nevgi & Lindblom-Ylänne, 2009b): people learn best when they can be active; they are able to create knowledge, i.e., construct it themselves. As described above, this also combines with meaningful learning. One application of the constructivist learning theory is socio-constructivism (Nevgi & Lindblom-Ylänne, 2009b), in which people learn in collaboration with others. Active participation creates positive feelings, such as an interest and sense of importance, thus increasing student engagement in her studies and resulting in an increased quality of learning. Teachers are seen as members of the learning community, more as peers supporting the students in their learning process than a source of information and the leader of the process. This type of approach to teaching requires teacher awareness and knowledge on how working methods and learning goals combine, and it enhances student responsibility for their own learning which requires teacher boldness actively to give responsibility to students (Biggs, 1996, 2003, pp. 11-32).

Many students, though, do not have a deep but instead a *surface learning approach*; they aim at getting assignments done with minimum effort and too little time (Biggs, 2003, p. 14; Biggs & Tang, 2007, pp. 22-27). When studying, these students use low-level cognitive methods, such as memorizing, even if the task requires more high-level methods, such as applying knowledge and creating knowledge, which students with a deep learning approach use by nature.

In contrast to Biggs' theory, Sami Paavola and Kai Hakkarainen instead (Paavola & Hakkarainen, 2005) suggested that there are three types of approaches to learning: monological, dialogical, and trialogical approaches to learning, illustrating corresponding focuses on acquisition, participation, and knowledge-creation in learning.

The *monological approach to learning* focuses on individual thinking and acquisition of knowledge, where the mind is seen as a container that can be filled with pre-given knowledge and structures. What happens within the individual's mind is emphasized, and learning is seen as an individual process that concentrates on how students will learn most efficiently. The *dialogical approach to learning* focuses on interaction between learners, with an emphasis on the process and participation in it as a member of the learning community. Learning concentrates on social interaction in authentic contexts where attention is paid to the community whose knowledge is constructed instead of to creative outcomes or products.

The *trialogical approach to learning* emphasizes innovative aspects of learning and how people create and develop in collaboration. Innovativeness becomes visible via new practices and structures during the learning process, where creativity with new ideas and new knowledge are in focus. The knowledge-building process, where participants push themselves to and beyond their limits of competence, aiming at collective knowledge advancement, is essential. It requires that participants question or criticize existing practices, analyze the situation, and come up with a new solution that they implement, evaluate, and then take into use. Ideally, the new, recently created knowledge is taken to use via individuals to the organizational level. Students are given responsibility, so in the process, participants contribute to the collaborative creation effort, and the social community enhances its participants' cognitive development (Paavola & Hakkarainen, 2005).

While the monological approach focuses on individuals and a dialogical approach to groups, the trialogical approach focuses on individuals and groups in creating common artifacts, such as theories, reports, plans, or software. The community plays an essential role, as in the dialogical approach, but while the dialogical approach emphasizes interaction as is, the trialogical approach sees interaction as the means to reach to goal, i.e. the creation and development of artifacts. To summarize, the question in the monological approach is about what the student gets, in the dialogical approach, it is about what students do, and in the trialogical approach, the question is about what the students create (Paavola & Hakkarainen, 2005).

Higher education teachers' approaches to teaching reflect their view on what affects students' learning outcomes. The approach that teachers have to their teaching is consequently reflected to and concretized as the teaching methods they select for their courses. There are three different approaches that illustrate the developing sophistication of the teacher's view (Biggs, 2003, pp. 20-32; Biggs & Tang, 2007, pp. 15-19; Biggs & Tang, 2011, pp. 17-20). They are presented here in levels.

Teachers with a *level 1 teaching approach* view teaching at the university as transmitting information. The teacher's role is to know much and to distribute what they know to students, typically via lectures and lecture notes. This can also be called a teacher-centered approach (Postareff & Lindblom-Ylänne, 2008; Trigwell, Prosser, & Waterhouse, 1999) or a content-focused approach (Postareff & Lindblom-Ylänne, 2008; Postareff, Lindblom-Ylänne, & Nevgi, 2009). There, the focus in teaching is on defined knowledge and methods, including distributing the knowledge to students, who are seen as passive recipients of all teacher knowledge. Content-based teachers prefer teaching methods that the contents can best be taught with. Level 1 and content-based teaching approaches are based on quantitative thinking of learning: the more the better. Because knowledge is appreciated, learning outcomes are quantified to the number of facts. Content-based teachers are not always interested in teaching but would rather focus on research. The teacher sees students as good students and poor students; those who learn and those who do not. Level 1 is comfortable to stay at because totally unreflective teacher-centered teachers do not see anything wrong with themselves; they stay in their comfort zone and instead blame the students. In short, teachers at level 1 focus on *"what students are."*

Teachers with a *level 2 teaching approach* still think quantitatively about learning, the same as level 1 teachers, but their focus is on larger concepts and understanding. Teaching is seen as learning management; teachers design, write material, read instructions on how to teach, and are totally teacher-centered instead of thinking of their students. These teachers do not stay in their comfort zones; as they know, there are even more effective ways to teach. Therefore, they blame themselves for not being effective enough. In short, teachers at level 2 focus on "*what do I do*".

Teachers with a *level 3 teaching approach* focus on supporting and enhancing students' learning in collaboration. They have pedagogical knowledge that they apply in a variety of teaching methods and prefer to select teaching methods that activate students, such as discussions, and emphasize the equality of students and teachers in the learning community. They know that different students need different types of methods to reach deep learning. Consequently, they select their teaching methods accordingly to reach the required understanding in the given situation for the specific students; they are aware of different options and are reflective and student-centered in their actions. In assessment, they focus on quality in student learning activity, so, e.g., essays are used. Teachers at level 3 can also be called student-centered (Trigwell et al., 1999) or learning-focused (Postareff & Lindblom-Ylänne, 2008; Postareff et al., 2009) in their teaching approach. They are interested in teaching and are motivated to develop themselves as teachers. In short, teachers at level 3 focus on "*what students do*".

The difference between level 1 and level 3 teaching approaches resembles the difference between behaviorist and constructive learning approaches. Like students with a deep learning approach truly engage in the learning task, teachers with a level 3 teaching approach truly engage in their teaching task. Teachers with a level 3 teaching approach put themselves into the task of teaching, which requires an interest in teaching and the motivation to do it. These types of teacher conceptions also affect students' learning approaches: teachers with a level 3 teaching approach are more likely to involve students in activities included in deep learning approach, while teachers at level 1 encourage more students to use surface learning methods. While a teacher at level 1 thinks that student motivation is a substance to teach, teachers at level 3 know that motivation is an outcome of their good teaching (Biggs, 2003, p. 57).

Good teaching aims at encouraging students to use a deep learning approach that creates quality learning and stimulates student competence. It includes, on one hand, actively maximizing the possibilities for using a deep learning approach and, on the other hand, actively minimizing possibilities for using a surface learning approach. Therefore, results of good teaching are that more students use those cognitive processes than students with a deep learning approach use spontaneously. Learning is about students' conceptual change; what learners construct in the learning situation depends on their personal motives and intentions, and teaching is a collaborative change of the learner's perspective. In this way, good teaching is also successful teaching, and student motivation comes as a product of good teaching (Biggs, 1996; 2003, pp. 1-98; Biggs & Tang, 2007, pp. 21-29).

Constructive alignment, as defined by John Biggs, means, in short, designing and selecting all teaching methods so that they support selected learning goals and assessment methods accordingly (1996, 2003, pp. 25-32; Biggs & Tang, 2007, pp. 50-64; Biggs & Tang, 2011, pp. 97-100; Nevgi & Lindblom-Ylänne, 2009a):

1. At first, the learning goals are defined.
2. Then, assessment methods are selected so that they support reaching the defined learning goals.
3. Finally, teaching methods and learning activities are selected so that they support assessment and reaching the defined learning goals.

Additionally, the desired learning activities resulting from the teaching methods should include active student participation; the view is that "it is what he does that he learns," as in the teaching approach at level 3. When the proper learning outcomes are designed, it is the teachers' task to design student learning activities in a way that the desired outcomes can and are likely to be reached. Aligned teaching should also result in a good learning climate in the course community. Non-alignment results in imbalance, resulting in poor teaching and practices that are contradictory to the original purpose. The learning situation includes and depends on both student-based factors and teacher-based factors. Only things under the teacher's control affect teaching, so there is no single reason for good or bad teaching, but teaching methods must be in line with the subject that is taught. For example, dancing cannot be taught by lecturing; instead, teachers act as models in the teaching situation. Maximum consistency should be imposed throughout the system to support the ultimate goals (Biggs, 1996, 2003, pp. 12-13; Biggs & Tang, 2007, p. 19).

Evaluation methods are known to steer students' focus and everything they do and thus affect what is learned. Therefore, assessment is an essential part of teaching and especially of assessment method design. Assessment should support study methods that result in deep learning. People behave as they are allowed to behave, so if the teachers do not demand, they cannot receive proper learning results. The surface approach to learning provides signs of learning, such as keywords and lists of facts. If teachers' focus is on these facts, the assessment is for small pieces of information rather than understanding at large, and the results can easily be surface learning (Biggs, 1996, 2003, pp. 11-33; Nevgi & Lindblom-Ylänne, 2009a).

Studies conducted at the University of Helsinki (Lindblom-Ylänne et al., 2009; Löfström & Nevgi, 2007a; Postareff et al., 2009) suggested that different fields of study have different learning and teaching approaches. Teachers in science were more content-based and less learning-based in their teaching approaches than teachers in human sciences, who in turn were more learning-based and less content-based in their teaching approach (Postareff et al., 2009). This difference has been explained by authors in human sciences as attributable to the differences in the research subjects and data structures they require: sciences are cumulative in nature and require hierarchical data structures, while human sciences as more holistic require understanding of phenomena. Correspondingly, a surface approach to learning was more common among students in science and in environmental and biosciences located at the Kumpula and Viikki campuses, and a deep approach was more common among students in human sciences at the City campus (Lindblom-Ylänne et al., 2009).

Teachers' teaching approaches are known to correspond to students' learning approaches (Trigwell et al., 1999; Postareff et al., 2009): a learning-based teaching approach enhances a deep learning approach, while a content-based teaching approach enhances a surface learning approach. Additionally, as former students later become teachers in the same faculties, they easily use their learning approaches as basis for their teaching approaches. To develop student learning approaches at university level toward deep learning, teaching approaches should be developed toward a learning-based teaching approach (Postareff et al., 2009), e.g., with studies in university pedagogy. The effectiveness of university pedagogical training has been studied (Postareff, Lindblom-Ylänne, & Nevgi, 2007, 2008, 2009): with 30 or more ECTS points of study, the proportion of content-based learning approach was decreased and that of learning-based teaching approach increased. With less than 30 ECTS points of studies in university pedagogy, the proportion of learning-based teaching approach was decreased, while that of content-based approach stayed the same.

Good teaching is more than individual teachers; the departmental atmosphere plays an essential role in creating a supportive or impedimental culture for its teachers (Biggs, 2003, p. xii). Good teaching requires input not only from teachers but also from departments and curricula (Biggs, 2003, p.

5; Löfström & Nevgi, 2007a). Teaching methods should be varied at the department level, which requires an emphasis at the department level on planning the curriculum and teaching methods (Nevgi & Lindblom-Ylänne, 2009a). When the quality of teaching is in focus, the role of the department is important in creating the quality of the whole department from the quality of individual teachers (Biggs, 2003, p. 271). Quality can be evaluated from different perspectives (Biggs, 2003, p. 267; Löfström & Nevgi, 2007a; Parpala, Löfström, & Kaivola, 2009):

- Quality as value (for money)
- Quality as methods fit for the purpose
- Quality as transforming (Biggs, 2003, p. 267) or change (Parpala et al., 2009)

The fit-for-purpose quality should further be based on the fitness of the purpose (Biggs, 2003, p. 267); if the purpose is not meaningful, methods aiming at it cannot produce quality. This requires the evaluation of web-based methods for their purposes (Löfström & Nevgi, 2007a). To achieve this, pedagogical purposes should have some type of collaborative confirmation. Research on successful teams has shown positive behavior, interest in peer views and conceptions (Numminen & Talvio, 2009), and collegial support as important elements of coping at work (Numminen & Talvio, 2009). Departments should encourage teachers to collaborate and make it possible through organized support (Biggs, 2003, p. 258; Löfström & Nevgi, 2007a). Educational developers could act as critical friends (Biggs, 2003, p. 260) for teachers in the formative discussion of their teaching development in a professional way. Subsequently, department heads should want teachers to adopt and apply web-based methods (Biggs, 2003, p. 228) and consequently want to make them easy to use. This would lift development to the department level (Biggs, 2003, p. 258), above the individual level of teachers, and increase department commitment (Löfström & Nevgi, 2007a) to the development of web-based teaching.

3 Using technology in teaching and learning

This chapter presents aspects of teaching and learning where benefits provided by technology used in teaching are investigated from theoretical and practical perspectives. For investigating teachers as users of technology in teaching in this study this chapter supports reflection on the methods used in the described decisions and actions.

3.1 Goals for using technology in teaching and learning

Concerning technology and its applications for various purposes, educational technology can be defined as technology applied for educational purposes. However, instead of applying the technology in any way, the definition should include only the pedagogically meaningful use of the technological possibilities provided and designed for the purpose. In addition, when using educational technology, teaching should be aligned. In all teaching, use of educational technology should be thought of as a subordinate part of the overall pedagogical design, where the pedagogical rules apply (Biggs, 2003, pp. xi-xii, 213-228; Biggs & Tang, 2007, p. xviii; Löfström & Nevgi, 2009).

The use of educational technology is a natural and logical component of the modern teacher-designed learning environment. All teaching activities and pedagogical design should aim at defined learning goals. The selection of working methods should support reaching these goals (Biggs, 2003, pp. 25-32). If web-based methods enhance the achievement of pedagogical goals, then they should be used (e.g., Rytkönen, 2009a), but if the teacher does not know what s/he wants from the selected method or is unaware of his/her intentions (Biggs, 1996), i.e., when there is a gap in the alignment chain or teaching approach, technology starts easily to steer user behavior and selections without his/her awareness (Jolanki & Karhunen, 2010). Web-based methods can be used alone, as in web-based courses and distance education, or in major or minor role combined with face-to-face methods. A pedagogically meaningful mix of web-based and face-to-face methods can also be called blended learning (Vaughan, 2010).

For example, the use of automatic assessment, when well-designed, can provide students with opportunities to practice at own time and pace. Assignments can be provided with immediate feedback and multiple repetitions that are not possible to organize with traditional contact teaching. The technology implemented in automatical assessment can be used to provide scaffolding hints, steering students' focus on the weakest issues based on previous responses or otherwise guiding the reading of material in a formative way. Automatically assessed learning activities if used in simple ways with multiple-choice questions may include pedagogical challenges; automatic assessment is easily used to assessing in a summative way for individual facts or other minor pieces of information, reasoning from teacher's level 1 teaching approach. If a learning activity is used in summative assessment, succeeding an the exam results from knowing more, i.e. presenting surface learning (Biggs, 1996, 2003, pp. 15, 223; Biggs & Tang, 2007, p. 238).

Using educational technology with a level 1 teaching approach results in teachers harnessing technology for more effective information distribution (Biggs, 2003, pp. 214-225): providing instructions and sharing PowerPoint slides through the web (Löfström & Nevgi, 2009). However, if course material and lecture slides had not been shared earlier at all, distributing them through the web can be seen as development. Managing learning overall with educational technology is very practical, and it is what happens with a level 2 teaching approach: the possibility of receiving student submissions through the web and assessing them in addition to sharing material is made comfortable and time-saving. Additionally, it allows teachers more flexibility in both time and place in the assessment process, as well as to students in their processes. Technology can even free teachers from the assessment process totally if automatic assessment is used. This is better compared to a level 1 approach, but if it stays there, it is not enough; in fact, teachers at levels 1 and 2 have only transferred their contact teaching methods to another medium, emulating the interaction from contact teaching sessions. With a level 3 teaching approach, teachers' aim in using educational technology is to activate learners in learning activities that are more meaningful with educational technology than without it. This requires teacher understanding of the special characteristics of web-based methods in, e.g., web-based discussions. If the pedagogical point is missing, it is unfortunately too easy to use technical restrictions in steering student focus and work flows. Instead, all web-based methods should be selected with pedagogical goals in mind (Biggs, 2003, pp. 214-225).

When using educational technology in their teaching, teachers should be familiar with issues specific to using collaborative technology in general. For example, identifying participants (Biggs, 2003, p. 224), respecting participants' privacy, the copyright of used and produced material, and understanding and supporting social awareness (Miettinen, Nokelainen, Floréen, Tirri, & Kurhila, 2003; Miettinen, Kurhila, Nokelainen, & Tirri, 2005; Kurhila, Miettinen, Nokelainen, & Tirri, 2007; Löfström & Nevgi, 2009) on the web compared to contact methods are issues that teachers should increase their understanding of before designing any web-based methods in their courses. Additionally, issues specific to educational context, such as knowledge of plagiarism[1] and ways to deal with it,[2] as well as the scalability of teaching methods (Biggs, 2003, pp. 224-225; Biggs & Tang, 2007, pp. 240-243), disregarding whether technology is used or not, increase teachers' possibilities to design meaningful web-based support for their students. Though methods and educational technology for distance education have been used from late 1900's, the opportunities WWW came with has increased the development of methods as well as technology. They are today varied and of high quality and as such, worth using. In many cases off-campus (Biggs, 2003, p. 224) and on-campus teaching methods provide similar learning opportunities. Additionally, if the students are not used to studying on the web and working together at a distance, web-based methods should be explicitly taught first. At the University of Helsinki, the ICT Driving License has been provided since 2005[3] to support this need. Since selecting teaching methods is the teacher's task, it includes the selection of the educational technology to be used. This is not an easy task, considering the enormous number of available possibilities and the awareness it requires. Additionally, pedagogical knowledge is needed (Löfström & Nevgi, 2009).

There are general theories and practices of using web-based methods in teaching, as presented in this chapter and in the literature (Löfström, Kanerva, Tuuttila, Lehtinen, & Nevgi, 2010; Biggs, 2003; Löfström & Nevgi, 2009; Uusikylä & Atjonen, 2005; Iiskala & Hurme, 2006; Salovaara, 2006; Suominen & Nurmela, 2011). In modern teaching, educational technology should be seen as an essential and integrated part of the pedagogical design and implementation, not discussed separately (Biggs & Tang, 2007). Just as teaching methods between subjects and fields of science differ (Lindblom-Ylänne et al., 2009), meaningful web-based methods must also differ and be selected correspondingly. Pedagogical knowledge, especially knowledge of good practices, is important to teachers for improving their teaching (Biggs, 2003, p. 6), but since practices of teaching include teacher contributions, they can result in both good and bad decisions, aware and unaware actions

[1] http://blogs.helsinki.fi/alakopsaa/for-teachers/what-is-plagiarism/?lang=en (8.3.2014)
[2] http://blogs.helsinki.fi/alakopsaa/for-teachers/i-suspect-student-of-deciet-what-to-do/?lang=en/ (8.3.2014)
[3] http://www.helsinki.fi/tvt-ajokortti/english/backgroundinformation.htm (8.3.2014)

(Uusikylä & Atjonen, 2005, p. 3). Teachers at any teaching approach level can have strong practical skills and use them with success in their teaching (Biggs, 2003, pp. 20-25; Biggs & Tang, 2007, pp. 15-17).

When designing learning activities for their courses, teachers should be aware of both the various possibilities that web-based methods provide and the roles they can give to web-based activities in their course settings. In addition, the students should be supported in increasing their awareness of the role of web-based learning activities in their learning process[4]. Thus, increased awareness of pedagogy, technology, and web-based methods combined is important in teachers' development of their teaching using educational technology.

3.2 Benefits provided by technology in teaching and learning

Web-based methods are only as good as the use to which they are put (Biggs, 2003, p. 214). This chapter illustrates theoretical benefits that experts are aware of and can motivate based on research results in human and technological fields or gained expertise (Dexter, 2002; Forsblom & Silius, 2002; Larvin, 2009). Because computers are better than humans at copying, repeating, and circulating, they are faster, reliable, and more flexible. Additionally, answers are more readable in handwriting, These properties make educational technology and web-based methods good for collecting large question and information databases, as well as, e.g., banks of comments (Biggs, 2003, pp. 218-223), such as Rubyric (Auvinen, Karavirta, & Ahoniemi, 2009). Educational technology is used for plagiarism control via specifically designed systems such as Turnitin[5] and Urkund[6] because plagiarism has become easier along with the increasing number of available resources. It also provides logistical and managerial advantages via automatic assessment. These basic ways of using educational technology come from the basic need of teachers to manage learning with a level 2 teaching approach, resulting from the need to manage data, which in results from the interest in saving time (Biggs, 2003, pp. 213-224; Biggs & Tang, 2007, pp. 240-241).

However, computers and web-based methods are good at much more. Used in a meaningful way, educational technology provides options for

[4] http://www.hyvan.helsinki.fi/wernetti/portaat.htm (8.3.2014)
[5] https://turnitin.com/static/products/index.php (8.3.2014)
[6] http://www.urkund.com/int/en/funktion.asp (8.3.2014)

pedagogical applications that enhance reaching the learning goals more than face-to-face teaching methods (Biggs, 2003, pp. 213-228; Uusikylä & Atjonen, 2005, pp. 182-183), in addition to increased user satisfaction (Waldorff, Steenstrup, Nielsen, Rubak, & Flemming, 2008). If the teacher knows how to engage learners in appropriate learning activities with web-based teaching methods, the selected methods may provide multiple benefits to learning. Based on the literature, benefits can be divided into four categories that are illustrated in detail in the following:

- Support for the development of students' cognitive skills
- Increased student and teacher awareness—and support for their focus on the essentials: learning and teaching
- Decreased teacher and student cognitive load
- Widening the range of assessment possibilities and methods that support meaningful learning

When used in a meaningful way, web-based methods can support the development of students' cognitive processes (Salovaara, 2006) in structuring knowledge and developing effective reasoning processes and self-directed learning skills (Biggs, 2003, pp. 233-235), which should increase positive motivation for their learning. Students can then learn planning and evaluation of their own work, incorporating it in the learning process. Besides the substance learning goals, they should also learn (Löfström et al., 2010)—and be systematically taught — to argue and give reasons, develop the ability to conclude, ask questions, and express themselves literally; in short, they learn information processing skills. These skills are intentionally developed by bringing students deliberately away from their comfort zones (Paavola & Hakkarainen, 2005). The constructive tension is needed for learning, but on the other hand, if students are not allowed to use the already developed skills, the tension may turn into frustration and decline. However, in both good and bad, these skills are needed at work and in group and project work. Students learn to regulate, direct, and steer their learning processes in reaching their goals (Lindblom-Ylänne et al., 2009); they learn to reflect on their learning. Web-based methods support and develop cognitive skills but also require them (Löfström & Nevgi, 2009).

The use of well-selected and meaningful web-based collaborative working methods can increase participants' social (Olson & Olson, 2009) and pedagogical awareness (Biggs, 2003, pp. 213-228; Miettinen et al., 2003; Kurhila et al., 2007). With collaborative methods, participants' social presence is enhanced when students study through the web (Olson & Olson, 2009; Löfström & Nevgi, 2009) and increase peer awareness of schedules with, e.g., group calendars (Olson & Olson, 2009). Thus, collaborative methods support in building a community and increase student commitment and possibility to focus on their studies. Web-based methods may ease a user's cognitive load (Löfström et al., 2010, pp. 28-29; Salovaara, 2006); instead of the user, they can visualize, structure, classify, remind, and combine, decreasing the need for memorization (Salovaara, 2006). Because of these types of memory support properties, web-based systems can also be called cognitive tools (Iiskala & Hurme, 2006) as artificial memory aids. Structuring, classifying, and combining features in systems support a user's memory recall and thus support learning (Lindblom-Ylänne et al., 2009). Visualizing makes thinking and learning processes explicit (Biggs, 2003, pp. 25-32; Salovaara, 2006) and even helps students to see in larger contexts (Ashman et al., 2009). Participants can see, read, and participate in other learners' learning processes (Salovaara, 2006) and ask for and receive support when needed.

Along with students, teachers have the opportunity to react to both positive and problematic issues when noticed and in this way steer the learning processes of individuals and, indirectly, the whole community. Individual knowledge becomes knowledge of the community; knowledge is shared in the whole learning community of students and teachers. As the process is visualized, even undone work becomes public, adding social pressure to the laggards. In increasing the transparency of learning (Salovaara, 2006), the ultimate aim would be to share evaluations and feedback (Rytkönen, 2009b). Easing the overall cognitive load by offloading work from the student to the software (Smith, Geddes, & Beatty, 2009) makes it possible for the users to focus on the essentials.

Assessment steers focus of studies in an essential way. This includes students making choices on how and how much effort to put into learning assignments, sometimes even trying to guess what the teacher may be aiming for. To decrease guessing and misunderstandings, publishing evaluation criteria is therefore important in the beginning of the course. Making the criteria visual in the web-based environment is easy for the teacher, and students may return to the criteria whenever needed. The possibility to return to the needed information is another benefit of web-based methods (Lindblom-Ylänne et al., 2009; Nevgi & Lindblom-Ylänne, 2009a).

Teachers have multiple possibilities for formative and summative assessment (Biggs, 2003, p. 141; Lindblom-Ylänne, Nevgi, Hailikari, & Wager, 2009) with qualitative and quantitative assessment methods (Löfström et al., 2010, p. 66; Nevgi & Lindblom-Ylänne, 2009a) that are included in the web-based methods they may select. Formative assessment is typically used during the course as a means of receiving feedback on the situation, for students to know how they are learning, and for teachers to know how their teaching methods are working. Summative assessment is used to test students' reaching the learning goals and to grade them on a scale. Summative testing is typically used at the end of a course, but mid-term exams are also used. Instead of assessing students via exams once at the end of a course, web-based methods make it easier to assess students' learning multiple times during the course (Postareff et al., 2009). For example, using multiple learning diaries (Lindblom-Ylänne et al., 2009) or portfolios (Biggs & Tang, 2007, pp. 222-227) supports learning by writing and develops information processing skills, self-reflection, the contextuality of learning, enhances students' own experiences, and meta cognition (Lindblom-Ylänne, Nevgi et al., 2009). Even ongoing formative assessment is possible. Giving formative feedback multiple times during a course supports steers and motivates learners (Löfström et al., 2010, p. 66; Löfström & Nevgi, 2009; Rytkönen, 2009b; Selänne & Kurhila, 2008). In addition, methods for peer and self-assessment become versatile (Lindblom-Ylänne et al., 2009; Löfström et al., 2010, p. 67; Rytkönen, 2009b).

When finished and undone work becomes explicit via visualization of the learning processes, the focus of assessment can be targeted to the activity or passivity of the student (Löfström & Nevgi, 2009; Romanov & Nevgi, 2006, 2008). Further, if the student activity is continuously peer-evaluated from the perspective of benefitting the course community (Rytkönen, 2009b), passivity, i.e., only reading, can be considered free-riding, and student activity can be evaluated as either useful for others or not. In this way, instead of having a dichotomist assessing scale of publishing or not, there is a third option for quality of publishing that is better than simply assessing the amount of activity. Additionally, the quality of the activity can be in focus. Students thereby change from information recipients to active information users (Biggs, 2003, p. 218) and creators while learning evaluation skills. Then, teachers' focus may be on directing with questions and comments (Löfström & Nevgi, 2009).

The copying of answers is technically easy to do via the web (Biggs & Tang, 2007, pp. 240-243) but also easy to reveal by plagiarism control systems, which makes copying of answers in total more difficult. However, well-planned learning assignments and exam questions do not encourage copying since other students' responses become sources for self-reflection. Instead of using technical restrictions and physical monitoring in exam situations, the assignments encourage students to engage in personal reflection and application of their knowledge.

Possibilities for flexibility in time and place are sometimes also needed (Biggs, 2003, pp. 213-228) for students' submissions and for teachers' feedback and assessment processes. Web-based working methods might even be subjectively more pleasing (Waldorff et al., 2008), or providing a more positive attitude may be of importance. The result of using web-based methods may be that learning happens faster (Uusikylä & Atjonen, 2005, p. 183) than in contact situations, and this may occur for several reasons, which are various between students. However, fast learning is not always wanted because of quality issues. When using web-based methods together with contact methods (Löfström & Nevgi, 2007a), the strengths of both types of methods can and should be benefited from (Biggs, 2003, p. 220; Löfström et al., 2010, p. 44). The contact meetings can be used for discussing problematic issues, preparing or summarizing web-based modules, or other working methods that require synchronized presence.

3.3 Benefits, values, and added value affecting user experience

A *perceived benefit* is something good that the end-user receives (Kotler, 2000; Kuusela & Rintamäki, 2002); the properties of a product, its service, and the experience of using the product that are evaluated and perceived as positive by the end-user. Correspondingly, what the end-user gives are the *perceived costs*: the expenses that the end-user must assume to lose concerning money, time, energy, and psychological issues. The ratio between benefits and costs build the *value* perceived by the end-user:

$$Perceived\ value\ = \frac{Perceived\ benefits}{Perceived\ costs} = \frac{What\ you\ get}{What\ you\ give}, when\ costs \neq 0$$

If there are no costs, the perceived value equals the perceived benefits (Kuusela & Rintamäki, 2002). Based on the equation, the more costs there are, the larger the perceived benefits must be to provide much value. On the other hand, to benefit, value must be given respect and the costs understanding. Therefore, perceiving values includes understanding the overall situation, which results in increased awareness.

The costs and benefits of learning are built from two parts (Biggs, 2003, pp. 56-73). Learning must be important to students and create value for the learner. The perceived benefits from the results must exceed the perceived costs of the process. Additionally, the learning tasks must be achievable, and learners must be able to expect success. Then, motivation follows positive experiences, such as good learning experiences. Correspondingly, the costs and benefits of teachers' involvement with web-based learning environments must give teachers the same feelings of value and success that the students perceive in their learning.

People make decisions on selections after consideration and choice, either aware or unaware (Kuusela & Rintamäki, 2002). In that process, the meaning of values plays an important role. *Added value* comes from comparative situations (Kotler, 2000). In the literature on usability and educational technology (Dunleavy, Dextert, & Heinecket, 2007; Forsblom & Silius, 2002; Silius & Tervakari, 2003; Silius et al., 2003; Silius et al., 2005), the concepts of value added and added value have been used in the discussion of web-based technologies and methods in teaching and studying when emphasizing the good pedagogical consequences of using computers and web-based methods along with traditional teaching methods. In general, added value is a measure of value in financial analysis, calculated as the difference between the selling price and the production cost. *Value added* can be defined as the increase in knowledge and skills that, for example, a student gains during his/her studies in higher education[7].

The concepts of added value and value added are apparently used as synonyms for each other, but with somewhat various meanings, when summarizing the educational technology literature in detail. They are used with vague motivations and, in some cases, without explicit definition, which becomes especially problematic when collecting data without explaining the concepts to respondents (Mahdizareh, Biemans, & Mulder, 2008). Added value is used as a synonym for benefit (Forsblom & Silius, 2002; Silius & Tervakari, 2003; Silius et al., 2003; Dunleavy et al., 2007), contribution, capability, and advantage (Dunleavy et al., 2007), but it has a personal point of view: it adds to the perceived value of the existing alternatives (Kotler, 2000, p. 598; Larvin, 2009).

Though not defined properly, added value can be described through its properties mentioned in the literature: it is something extra, something that is expected, even wanted. Added value can be realized (Silius et al., 2003), but not necessarily, and on the other hand, problems can be turned into added value (Forsblom & Silius, 2002). They are personally perceived (Mahdizareh et al., 2008), highly valued (Larvin, 2009), and obviously very subjective;

[7] http://www.qualityresearchinternational.com/glossary/valueadded.htm (8.3.2014)

they are opinions (Mahdizareh et al., 2008). When explicitly defined, added value “makes possible something that otherwise would be impossible or less viable to do” (Dexter, 2002); it is the contribution of selections to teaching and learning (Dunleavy et al., 2007). In this way, added value provides extra benefits for the user (Dexter, 2002), and correspondingly, pedagogical added value provides benefits for learning (Krzywacki, Korhonen, Koistinen, & Lavonen, 2011).

Compared to the added value received by using web-based methods in addition to face-to-face methods, for value provided by a certain web-based method in comparison to using web-based methods in general, the value received is not as obvious. Details matter (Nielsen, 1993, p. 15), as do perceptions and individual values. The suggested general sources of value provided by web-based methods, such as flexibility concerning time and place, are provided by several systems. However, comparison of the use of two systems provides the little extra for the users, i.e., the added value that motivates the selection of the specific system and methods in use. The final selection is often a compromise. The concept of value is perceived as important in this study, which aims at revealing the priorities in the compromise situations and the motivations behind them.

When considering the selection of a software application among a number of alternatives, system acceptability (Nielsen, 1993, pp. 24-25) as presented in Table 3.1 is used in evaluating whether the system fulfills the needs of end-users and educational developers.

Table 3.1. System acceptability hierarchy (Nielsen, 1993).

System acceptability			
	Social acceptability		
	Practical acceptability		
		Usefulness	
			Utility
			Usability
		Cost	
		Compatibility	
		Reliability	

When the system is a web-based learning environment used for educational purposes, the end-users are teachers and students. The system should meet, in addition to the general requirements, pedagogical demands; it should not only be suitable for giving support in reaching the intended learning goals (Silius & Tervakari, 2003) but also support the teachers in their designing and teaching roles. When *system acceptability* for a web-based learning environment is at its highest, the technical implementation and pedagogical design allow the users to concentrate on what is essential in learning and supporting learning ([8]; Nielsen, 1993). When defining whether the system in focus meets all given user and pedagogical needs, i.e., when considering system suitability, the acceptability concept is split into sub-attributes, which can be evaluated or graded to help the acceptability definition process.

If the system supports needs and goals that are socially acceptable, it has high *social acceptability* (Nielsen, 1993). Part of the social acceptability comes from the working culture, i.e., if there is social pressure or common social acceptance to use the particular system for the goals in question. When discussing educational technology, social acceptability is seen as social support from the teachers' working community and particularly as support from organizational management[8]. A *practically acceptable* system has an acceptable cost structure throughout the system lifecycle as well as fulfills needs for reliability, usefulness and compatibility to other systems. Concerning educational systems, compatibility needs include other educational systems and administrative systems such as study register and user administration. *Perceived usefulness* describes whether the system could be used for reaching the desired goals, and it can be split into sub-attributes of utility and usability based on the specified needs and goals. Nielsen (1993) described utility as the needed amount of provided features for reaching the required goals and usability as the user's ability to use these features, i.e., one kind of measure of quality of the provided features (p. 25). In this way, *utility* answers the quantitative question of "*what*" the user can do and *usability* the qualitative question of "*how*" the user can do it.

When discussing systems used for educational purposes, the concepts of utility and usability are investigated further from the pedagogical perspective. To do that, the pedagogical concepts are added to the original system acceptability in Table 3.1 as illustrated in Table 3.2. *Pedagogical utility*, then, should concern the support the system provides for learning (Silius & Tervakari, 2003), and *pedagogical usability* shows how the features that support learning are used. In considering pedagogical usability, it is possible to evaluate the pedagogical design of individual course area implementations (Silius, Tervakari, & Pohjolainen, 2003; Silius & Tervakari, 2003) or present overall ideas of using a web-based learning environment. Issues that are relevant for the users are whether the system is perceived as familiar, pleasing, easy to use and whether it supports the user's personal working methods and pedagogical approach. Pedagogical utility in turn presents the

[8] http://www.hyvan.helsinki.fi/wernetti/oppilaitos_oppimisverkoston_solm.htm (8.3.2014)

alternatives that the system as a whole provides for a) students in their learning and b) teachers in their work on supporting students' learning and assessment.

Table 3.2. System pedagogical acceptability hierarchy based on the usability theory of Jakob Nielsen (1993 p. 25), developed by a research group at the Tampere University of Technology (Silius et al., 2003; Silius et al., 2005; Silius & Tervakari, 2003; Silius, Tervakari, & Pohjolainen, 2003), a research project funded by TEKES (Horila et al., 2002) and Petri Nokelainen (2005) to take into account pedagogical usability. Combined by the author.

System's pedagogical acceptability			
Social acceptability			
	Social recommendations in teacher community		
	Trends in collaborating universities		
Practical acceptability			
	Lifecycle costs		
	Reliability		
	Personalization possibilities		
	Compatibility with other educational systems and study register		
	Usefulness		
		Pedagogical utility	
			Support for students for learning activities
			Support for teachers for supporting students' learning
			Support for assessment
		Pedagogical usability	
			Familiarity
			Subjectively pleasing
			Few errors
			Easy to learn, use and remember
			Support personal working methods
			Support personal teaching approach

When going down in the hierarchy and the precision of the requirements increases, so does the degree of subjectivity and personal opinions in the evaluation. For example, the acceptability of cost is more objective to evaluate than how pleasing a system is for a user. Personal opinions are especially emphasized when considering perceived usability of the system. When evaluating the pedagogical values of a web-based learning environment system, the top-most attributes are at the system level and can be evaluated at organizational level and beforehand. When going down the hierarchy, the attributes must be evaluated by groups of end-users and individual end-users, and the overall evaluation should include all these evaluators. The end-user evaluations cannot properly be done beforehand but should be done afterward, with experience. The usefulness evaluation concerning pedagogical utility for a web-based learning environment system is made in advance by experts, and that concerning pedagogical usability is made from course area implementation perspective afterward by students and teachers (Silius et al., 2005). As a consequence, though overall system acceptability is easily considered objectively measurable, it consists of subjective values, so overall acceptability ends up in a compromise. In situations of choice, for example when concerning whether to change from one system to another, these aspects are in consideration, as has been in the Finnish national and especially in the case of University of Helsinki situation with web-based learning environment systems, as presented in chapters to follow.

The Finnish culture philosopher Erik Ahlman defined a *good tool* in 1939 (Ahlman, 1939, p. 107) with a broad meaning including physical equipment as well as methods, concepts, and theories: everything used and created with awareness, generally adopted, and in permanent use. Therefore, tools could also include, e.g., teaching and research methods. The definition of a good tool included two aspects: the purpose that the tool promotes is good, and the change in reality that the tool is created for is actually reached. Therefore, a good knife, for example, would be a sharp, lethal weapon, though dangerous in the hands of a child. For a good tool, Ahlman defined four properties to fulfill the task a tool is intended for:

1. As perfectly and precisely as possible
2. With the least possible energy consumption
3. With the least possible waste of time; quickly
4. With the least possible bad feelings and unfavorable side effects.

Good tool properties include quick and effortless creation of and learning to use the tool, and successful use should be independent of unanticipated incidents (Ahlman, 1939). These properties are still valid and well-suited even for computer systems. Similar properties have been defined in usability research, i.e., research on how computer systems could be as "good" and supportive as possible for the purposes they have been designed for (Kuutti, 2003). Probably the most frequently used list on usability attributes was presented by Jakob Nielsen (Nielsen, 1993; Kuutti, 2003), including at least these five attributes: learnability, efficiency, memorability, few errors, and end-user satisfaction.

Learnability and efficiency were defined by Ahlman (1939) as the tool being quick to learn about and effective to use so that the user can start getting the actual work done with high productivity (Nielsen, 1993). Memorability requires that, once the tool has been learned, it is easy to return to it without the need for re-learning. All three attributes support additionally in reducing the end-user's cognitive load (Kuutti, 2003). The tool—here, a system or method—should be intuitive to use so that end-users make few errors, and when they do, they can recover from them (Nielsen, 1993). Finally, the system should be subjectively pleasing to use. There would be further attributes and even longer lists of attributes, but overall, a short and concise list supports evaluation and decision-making well, while a longer list is easily too heavy in practice (Kuutti, 2003). Overall, a good tool supports the user in succeeding better in using the tool than without using it. This would also be called a good user experience (Garrett, 2006; Hassenzahl & Tractinsky, 2006). For example, good educational technology should facilitate end-users' focus on the teaching, studying, and learning processes instead of the more obvious technical process.

3.4 Perceived benefits and values of technology in teaching and learning

Teachers with learning-based teaching approach are more interested in developing themselves as teachers than teachers with content-based teaching approach (Postareff et al., 2009). Web-based learning methods that provide possibilities for structuring knowledge, developing effective reasoning processes, and developing self-directed learning skills that increase motivation for learning and develop group skills (Biggs, 2003, p. 234) are also important skills for teachers when they study and learn new information to be adopted in their practice. Teachers who actively use web-based methods have proven more often to have a constructive learning approach than teachers who do not (Hakkarainen et al., 1998, Mölsä, 2006). How web-based methods are used can be expected to emphasize the teachers' teaching approach. While technology as a field of study in science requires hierarchical data structures and understanding, as presented earlier, teachers in human sciences might face different challenges in understanding and using educational technology than natural scientists because of their different structuring of data. On the other hand, computer scientists, as content experts in the technology part of educational technology, could be expected to have an advantage in using technology in their teaching. The strong technical background and understanding of the possibilities that educational technology may provide make computer scientists more versatile in piloting and developing different possibilities, of which many are pedagogically meaningful (Auvinen et al., 2009; Kurhila et al., 2007; Miettinen et al., 2003; Miettinen et al., 2005; Selänne & Kurhila, 2008).

A teacher’s personal expertise as a supporter of the learning process (Uusikylä & Atjonen, 2005, p. 217) includes routine and strong content knowledge to be taught as well as knowledge on pedagogy (Lahtinen & Toom, 2009) and educational technology. Theoretical knowledge on the contents makes it possible for the teacher to be aware on how the contents should be taught. Increased awareness as a result of reflection is needed for personal development; based on award-winning teaching practices, collecting feedback and reflection is what matters (Biggs, 2003, pp. 1-10). The first step in improving teaching is, therefore, to increase teacher awareness (Biggs, 2003, pp. 11-33) and understanding (Biggs, 1996) and to help them operationalize the theory into practice.

Personnel training is a central method in increasing teacher knowledge (Lahtinen & Toom, 2009), and the essential contents include pedagogy, educational technology, and overall personal development. Increased knowledge also increases awareness on the subject, which enhances the finding of value in the methods used. The values that steer the choices—saving time or true pedagogical values that support students’ learning, though it would require more effort and time—depend on the teacher’s teaching approach. Therefore, to select teaching methods based on pedagogical grounds instead of saving time, teachers must possess a strong pedagogical view. Consequently, development in using educational technology requires knowledge of learning and teaching approaches, i.e., increased pedagogical awareness and reflection concerning technological and pedagogical issues.

There are benefits that teachers most likely see as values in web-based methods, and they set those benefits as goals for their teaching in the planning stage (Dexter, 2002). There are also benefits that participants recognize at the end of the teaching and learning process (Silius, Tervakari, Yritys, Kalliomäki, & Pohjolainen, 2005), after which they are perceived as sources of value. Since perceptions and value are subjective, it is possible that different course participants perceive different values (Silius & Tervakari, 2003; Silius, Tervakari, Kaartokallio, & Yritys, 2003), and even issues that are anticipated as problems beforehand are afterward considered positive. Finally, the teacher’s feelings of ease and enjoyment in using the selected methods are most important (Biggs, 2003, p. 221) in the evaluation of perceived values.

The most obvious perceived value is the increased flexibility in both time and location perceived by teachers and students. Students value increased flexibility, access to, and quality of course materials and increased autonomy in studies (Löfström & Nevgi, 2009; Silius et al., 2005). Teachers perceive value in the possibilities for both individual support and a course-community-wide increase in equality. These can be provided by discussions and spontaneous groupings. Visual communication has been noted as a significant didactical element by students as well as teachers (Nevgi & Tirri, 2003, pp. 166-167; Silius et al., 2005).

A study by Mahdizareh et al (2008) sought to identify factors that could explain teachers' use of web-based systems in teaching and instruction. In the study, 178 teachers at Wageningen University in the Netherlands were provided with a questionnaire including statements on the use of a list of methods and techniques and their perceived added value for students' learning. The six most frequently used methods, listed below, were used by at least 80% of teachers at least sometimes. The same six methods were perceived to produce at least moderate value by at least 75% of the respondents (Mahdizareh et al., 2008). The listed methods illustrate level 1 and 2 approaches to teaching (Biggs, 2003, pp. 20-33) and support mostly monological learning (Paavola & Hakkarainen, 2005):

- Presenting course material and literature
- PowerPoint presentations
- Email and mailing list
- Course information
- Course calendar and schedule
- Course announcements and news

The rest of the methods, listed below, were not used at all by at least 73% of the respondents, and these were not perceived as producing value at all by 46–86% of the respondents (Mahdizareh et al., 2008). These methods illustrate level 1 to 3 approaches to teaching (Biggs, 2003, p. 20-33) and provide possibilities for monological, dialogical, and trialogical learning (Paavola & Hakkarainen, 2005):

- Online collaboration
- Online discussion
- Application sharing
- Online testing
- Videoconferencing and net meetings
- Shared whiteboard
- Voice conferencing

The study concluded that the more positive attitude the respondents had toward web-based methods, the more they used their possibilities and the more added value was perceived; i.e., perceived added value was a part of teachers' attitudes toward web-based methods. Additionally, the lists of most and least frequently used methods presented a division between traditional, simple methods in the first list and modern, more complicated methods, which require more knowledge on the subject and some extra effort in learning how to use them in the latter list. Unfortunately, the study did not include explanations on why the teachers perceived added value in the methods they had used. The methods selected or web-based methods in common do not automatically provide added value (Dunleavy et al,, 2007; Silius et al., 2003; Horila, Nokelainen, Syvänen, & Överlund, 2002), but the value should come from the contents and methods (Horila et al., 2002) designed by the teacher.

In Finland, the ESF-funded WerNetti-project[9] piloted web-based methods for networking and tutoring in adult education from 2002–2005. One hundred sixteen students from 43 companies participated in the project with 58 instructors[10]. At the end of the project, students and instructors were interviewed to collect and combine experiences and practices from both networking and web-based methods during the three-year project period. The project found four roles for the use of web-based methods in adult education[4]:

1. Publishing course information from teachers to students
2. Distributing material from teachers to students and submissions from students to teachers
3. Discussion within the course community with peer interaction
4. Supporting students' overall development

Each step includes and adds to the previous ones. Step 1 includes interaction only from teachers to students, while Step 2 also includes interaction from students to teachers. Only starting with Step 3 is there peer interaction between students in the course and active participation in the learning community. This type of structure for collaborative learning is based on a socio-cognitive learning approach. In Step 4, the teachers' role is to support the learning process in dialogue with the students; with open and authentic learning assignments that enhance students' collaborative knowledge-building, reflection, and evaluation of their own knowledge and learning processes. The presented ways of using web-based methods build steps of

[9] http://www.hyvan.helsinki.fi/wernetti/ (8.3.2014)
[10] http://www.hyvan.helsinki.fi/wernetti/tekijat.htm (8.3.2014)

increasing support for learning, but they respectively demand increasing capabilities from the participating students and teachers[4].

The University of Helsinki collaborated in the Finnish national project Verkko-opetuksen laadunhallinta ja laatupalvelu (Quality Management in E-learning[11]) during the first decade of the 2000s. According to studies conducted within the project, University of Helsinki teachers had mainly used two web-based methods in their teaching: sharing material and student submissions within the community, and interaction via discussions (Löfström & Nevgi, 2007a; Löfström & Nevgi, 2009).

The studies presented in this chapter illustrated that teachers' perceived benefits of web-based methods resembled those of the methods that they actually used. Based on selected web-based methods, most teachers in the University of Helsinki studies (Löfström & Nevgi, 2007a; Löfström & Nevgi, 2009) would have been at Biggs' levels 1 and 2 in their teaching approaches (Biggs, 2003, pp. 20-33). Based on the literature, the theoretical benefits provided by educational technology were not always applied in practice. This easily results in non-alignment of teaching. Maybe teachers "haven't thought of it," which would result from lack of awareness (Biggs, 1996, 2003, p. 31; Smith et al., 2009).

[11] *Why do we need quality management in e-learning?* http://www.vopla.fi/in_english/ (8.3.2014)

4 Technology used in teaching and learning

This chapter focuses on defining and presenting the technology used in teaching and learning. The two systems used as web-based learning environments, Blackboard and Moodle, are presented in more detail because they were used at the University of Helsinki during the study period 2008-2011. Reported teacher experiences are illustrated by a literature review, and the chapter ends with a discussion on development trends in selecting systems for organizational use. When investigating teachers as users of technology in teaching, this chapter supports reflection on the selected features used in the decisions and actions described.

4.1 Definitions

Students' learning environments are the environments in which learning takes place, defined as the combination of spaces, social relationships, and working methods in the community providing and enhancing learning opportunities. Different dimensions together provide these opportunities: there are physical, social, pedagogical, and technological dimensions in space and time (Manninen & Pesonen, 1997). For example, a lecture hall or a laboratory, as a physical space, is a learning environment, when the students and teacher are socially present, working for pedagogical learning goals. During the night, it is just an empty room. The pedagogical motivation for learning environment thinking is based on the socio-constructive learning paradigm (Nevgi & Lindblom-Ylänne, 2009b); people learn best when they build knowledge together with other learners (Manninen & Pesonen, 1997; Manninen, 2000), and the group of learners builds a learning community.

Just as the lecture hall and laboratory are rooms where learning is meant to take place, though any room could be used for the purpose, a *web-based learning environment* is also a certain type of educational technology instead of any technology used for educational purposes. Web-based learning environments are intended to provide support for teachers and students in their teaching and learning processes; a good web-based learning environment can be seen as a system that steers the learning process as seen from student perspective. To note is that a web-based learning environment can be used as the only dimension of the learning environment, as in courses on the web, or as one dimension of a variety, as in blended learning.

Web-based learning environments are typically systems with restricted access where participants log in with their user accounts, providing identification with real names instead of nicknames. Typical web-based learning environments include properties for teacher-student and students' peer-to-peer communication, uploading and sharing files and links, submitting assignments, taking online exams, and assessing student activity. The authentication of users makes it possible to identify all course participants. Besides these more or less standard possibilities, different applications provide additional methods: e.g., some programs allow anonymous working methods, while some programs require writing with participants' own names.

Some systems provide more or fewer possibilities for work in meaningful combinations of participants, while group work possibilities aside from discussions are not provided at all in some systems. Even the standard activities, e.g., the discussion forum posting process, can be implemented in many ways, providing various work flows and thus possibilities. Examples of this type of application widely used in Finland are Moodle,[12] Blackboard[13] (formerly WebCT), Fronter,[14] and Optima,[15] of which Moodle and Blackboard are addressed more deeply in this study.

Web-based learning environments are sometimes called virtual learning environments (VLEs) (Manninen, 2000), course management systems (CMSs), and learning management systems (LMSs).[16] These are all closely related concepts that are typically used as synonyms. The differences in shades of meaning come from the perspectives emphasized. A virtual learning environment provides a wider perspective on the subject than a web-based learning environment since a VLE includes the possibility of using a computer in education without an Internet connection. This means that the concept cannot refer to a single program but to a wider range of systems and techniques used for learning purposes. Additionally, it can be regarded as somewhat old-fashioned. While "web-based learning environment" emphasizes the educational opportunities that the system provides, "learning management system" emphasizes the technical platform provided for managing the steps in the working process corresponding to a level 2 teaching approach (Biggs, 2003, p. 20-33). Even so, all these concepts are considered synonyms in the scope of this study. In this study, the concept of a

[12] http://moodle.org/ (8.3.2014)
[13] http://www.blackboard.com/ (8.3.2014)
[14] http://com.fronter.info/ (8.3.2014)
[15] http://www.discendum.com/optima_en (8.3.2014)
[16] http://moodle.org/about/ (8.3.2014)

web-based learning environment is used to enhance the focus on learning support instead of technical support. When the software itself is referred to, the concept of a web-based learning environment system—or, in short, the system—is used.

Considering concept abstraction hierarchies, in this study, a web-based learning environment refers to the whole system, i.e., the software application used at one web address, e.g., http://moodle.helsinki.fi. The web-based learning environment provides separate working spaces for each course community. Each working space for a course community is called a course area. The hierarchy of definitions is illustrated in Table 4.1.

Table 4.1. Top-down concept hierarchy for the open web, a web-based learning environment, and course areas.

Level	Concept	Restriction
1	World Wide Web	Open
2	Web-based learning environment	Organization
3	Course area	Course community

Authentication to each course area requires a login to the web-based learning environment as well as access permission to enter the course area. Each course area is designed by individual teachers using properties provided by the web-based learning environment. This definition differs from the perspective used in some previous studies (Horila et al., 2002; Tervakari, Silius, Ranta, Mäkelä, & Kaartokallio, 2002; Silius, Tervakari, & Pohjolainen, 2003; Nokelainen, 2005), where the concept of a web-based learning environment refers to a single course area implementation for a specific course setting. In these cases, the system used as the platform for these course areas was not in focus. In this study, however, the opportunities that the technical platform as a whole offers for the end-users are the focus of interest, and the individual course areas are considered implementations of provided opportunities.

Each individual teacher may design his/her course areas according to the needs and knowledge, develop them over time, and utilize the opportunities provided by the system in different ways on different courses. Additionally, the opportunities that the system provides are called features, with which teachers create material and working methods for students and themselves. Typically features include alternatives for sharing and submitting material, alternatives for discussion, and features for collaborative working methods. All the central features are implemented in Blackboard and Moodle.

A purposeful learning environment creates situations where motivated learners cannot easily escape without learning. There, the teachers act as brokers between the learning environment and the students. A pedagogically designed system should accordingly act as a broker between the teachers and what educational developers enhance in pedagogical development. As the teacher should know how to bridge the gap between surface and deep learning approaches with her teaching methods (Biggs, 2003, pp. 11-33), the web-based learning environment should compensate for the gap between level 1 and level 3 teachers in designing their teaching.

4.2 Systems

Blackboard is a proprietary system provided by Blackboard Inc. Blackboard may support teaching with various learning approaches (Löfström & Nevgi, 2009). It provides the basic properties of all web-based learning environments, such as discussions, distributing and sharing files and links, submitting assignments, and assessment[17]. However, to support student activities, it must be combined with another system, e.g., a wiki (Löfström & Nevgi, 2009). The contents are grouped by type, i.e., materials, assignments, and quizzes, for example. For students, Blackboard offers a number of properties for making notes and following students' progress. For teachers, Blackboard is equipped with a variety of follow-up and assessment properties. Each of the contents in Blackboard can be published for individual audiences with individual schedules using the Selective Release feature[17]. When a course area is created, teachers must first select which properties they are going to use before creating the actual contents with the properties and linking the contents to the course area[18].

As proprietary software is provided by commercial vendors that develop their product based on their development strategies, typically, there are few or no possibilities for influencing the development of the product; the package comes as is. This makes the users of proprietary software more dependent on the vendor (Computer Economics, 2005), its decisions, and its development direction. The products come with annual license fees that tend to be remarkable. The positive factor of proprietary software is that, if the

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[17] *WebCT CE6: Työkalujen yleiskuvaus*. Mediamaisteri Group, unpublished technical instructions

[18] *WebCT CE6—Mitä uutta kurssin suunnittelijoille?* Mediamaisteri Group, unpublished presentation notes.

package is stable, little time and knowledge are needed for maintenance; in that case, it is a service-for-money approach.

Moodle is an open-source system developed by the international Moodle community. The system consists of a core, i.e., a basic installation package, including the opportunity to build the system with additional installable modules. The features in the basic installation package are similar to those of other many-sided web-based learning environments: distributing files, folders, and links, various types of discussion forums, features for producing text, and a number of individual assignment alternatives, such as submitting files and text and taking quizzes, lessons, and choices.

Teachers have overall administration permissions in their course areas. Material can be produced and published only by teachers: besides instructions, files, and links, teachers can upload static or interactive contents produced with separate systems designed for the purpose. Collaboration within the course community is supported, aside from discussions, with a wiki and a vocabulary, i.e., an opportunity to collect concepts and definitions collaboratively. In addition to course contents, Moodle provides features that increase user awareness on issues of the day, such as information about currently logged-in peers, latest news, and coming events.

The design and development of Moodle started with the need for a learning system at universities that would support learning activities based on the socio-constructive learning approach (Dougiamas & Taylor, 2003;[19],[20]; Löfström & Nevgi, 2009), aiming for connected knowing and transformative learning. Originally, Moodle was the leading developer Martin Dougiamas' PhD project (Dougiamas & Taylor, 2003). It was intentionally developed in a developer community, which was started as part of the PhD project and published as an open-source product available for download[21] under a GNU Public License.[22] The open source and the development work in a community were intended to make pedagogical and technical development versatile. The developer community intentionally uses Moodle as their discussion and development platform, making it possible for the developers to learn Moodle from the student perspective (Dougiamas & Taylor, 2003).

Moodle has been considered easy to use and its features versatile (Löfström & Nevgi, 2009). It is distinguished from other web-based learning environments by its course area structure: instead of presenting the uploaded

[19] http://docs.moodle.org/en/About_Moodle (8.3.2014)
[20] http://docs.moodle.org/en/Philosophy (8.3.2014)
[21] http://download.moodle.org (8.3.2014)
[22] http://www.gnu.org/copyleft/gpl.html (8.3.2014)

material in groups based on type, as in, e.g., Blackboard, Moodle presents the course area contents in consecutive order. Teachers are then able to sort materials, instructions, and learning assignments in the order they appear on the course.

When reviewing literature on end-user experiences from the teacher perspective, publications represents individual teacher opinions: an IT lecturer at an institute of technology in New Zealand (Corich, 2005a, 2005b) and two assistant professors at a university in the U.S.A. (Beatty & Ulasewicz, 2006), who reported on their experiences after using Blackboard and considering a change from Blackboard to Moodle. The reviewed experiences involved early Moodle versions 1.4 and 1.5 but nevertheless represented experienced (Beatty & Ulasewicz, 2006; Corich, 2005a, 2005b) and novice (Beatty & Ulasewicz, 2006) perspectives on using web-based methods in higher education. The reviewing teachers tested Moodle on their courses during one semester, and one of them (Corich, 2005a, 2005b) tested the conversion of Blackboard contents to Moodle format. Based on previous studies of teachers' experiences and preferences, Moodle was perceived to exceed Blackboard in:

- **Ease of use and support of personal working methods:** when teachers build their own course areas, the teacher interface needs to be easy to use and intuitive. This was perceived to be better implemented in Moodle than in Blackboard. The features such that teachers could always see in Moodle the same things that the students saw and the quick and easy editing of contents were appreciated. In Blackboard, there are separate views for course designers and teaching, and teachers might not have permissions to edit their own course areas if they did not have designer permissions.
- **Support for learning and teaching approach:** in Blackboard, the only way to publish course contents was to arrange elements of the same type into categories: files, assignments, and so on. In Moodle, the contents can be arranged based on the course timeline, structured by course weeks. This was appreciated by both the authors and their students.
- **Personalization possibilities:** the organizations were able to include any needed features as additional add-ins in their Moodle installations.

Blackboard remained preferred to Moodle in:

- **Familiarity:** The big issue in Blackboard is that teachers using Blackboard are used to using it. Moving to any other system is a change. Learning a new system and re-implementing the familiar contents in a new environment takes time and effort. Furthermore, teachers who had structured their courses through a document storage approach (Corich, 2005a) in Blackboard might have trouble with Moodle which provides the contents in a timeline structure. For teachers used to only sharing their lecture notes, being used to doing in exactly one way, it is difficult to think pedagogically beyond that.

- **Support for follow-up with reports:** A Blackboard feature not as well implemented in Moodle is the possibility to get reports and graphical statistics from the course areas.
- **Support for personal working methods in the editing of written posts:** One specific preference of Blackboard was the ability to re-edit previously written forum posts, while in Moodle, there is by default half an hour to edit, and then the editing possibility is closed. In Blackboard, editing is closed when there are replies to the post.
- **Support for learning activity in content-sharing:** One important feature in Blackboard and, at the time the article was written in 2006, missing from Moodle was the possibility to share student work inside the course community. The basic properties of Moodle support student-teacher communication, in addition to the discussion forums, which were the only student-student interaction alternatives. The modern versions of Moodle, however, also provide properties for students' peer sharing of contents.

Overall, Blackboard and Moodle were perceived to provide teachers with a wide range of methods for web-based publication, collaboration, and feedback. The important differences came from the subjectively pleasing images that users had overall, the perceived ease of use, potential familiarity, and the perceived support for personal teaching approaches and working methods. Teachers are, though a smaller end-user group than students, the most important end-users, the ones selecting the systems and methods for their students. According to the literature presented above, teachers were more satisfied with Moodle than with Blackboard. What was missing, though, were the concrete reasons for the satisfaction; was it the look and feel or the pedagogical opportunities that the properties provide, or was it maybe the course structure, which was designed by the teacher and sometimes had little and sometimes everything to do with the system itself. The teacher perspective was presented only through case studies since there was no documentation on surveys conducted to show wider teacher experiences. The only documented opinions were from early, more immature than current versions of the systems.

4.3 Development of used systems

The international movement in selecting and changing web-based learning environments in the early 2000s has emphasized the growing popularity of open-source software solutions instead of proprietary systems (Computer Economics, 2005; Lowendahl, 2010). In particular, the trend of selecting Moodle has been visible internationally, according to the literature (Beatty & Ulasewicz, 2006; Chao, 2008; Corich, 2005a, 2005b; Jamieson & Verhaart, 2005; Skelton & Wilson, 2007; Wainwright, 2009). Reasons for change decisions were less often addressed in the literature than system comparison results. Based on published and unpublished[23] end-user experiences (Beatty & Ulasewicz, 2006; Bremer & Bryant, 2005; Corich, 2005a, 2005b; Kennedy, 2005; Machado & Tao, 2007; Skelton & Wilson, 2007) of trials and parallel use, a future change from Blackboard or WebCT to Moodle could be strongly motivated by end-user satisfaction with software qualities and overall preference.

According to the literature presented previously, discussion on a possible system change has been activated by teachers who have perceived Moodle to provide increased pedagogical usability. However, with the reported, actually implemented changes, technical and monetary benefits provided by open-source software, being generally recommended (Pfaffman, 2007), appreciated (Computer Economics, 2005), and increasing in popularity (Lowendahl, 2010), played a more significant role than the increased pedagogical benefits. As reported by Ahmed (2005) and Mägi (2005), an open-source solution was selected because of the interest in reducing expenses. The web-based learning environment system should be integrated into local systems such as study registers (Brace, Kennard, & Walker, 2006)—an opportunity provided by, e.g., Moodle. Open-source software provides opportunities for personalization (Ahmed, 2005; Mägi, 2005) that the organization may need. Additionally, Moodle provides opportunities for interface customization based on local themes and logos (Brace et al., 2006). Another emphasized motivation was the interest in and opportunity to participate in and benefit from the interaction in the national (Mägi, 2005) or international (Ahmed, 2005) Moodle developer community. In one case (Brace et al., 2006), the intuitive look and feel of Moodle was perceived to have been the deciding factor in the system selection, in addition to providing a wider range of features than WebCT.

[23] *General survey analysis on Web-Based learning environments.* http://www1.carleton.ca/lmssupport/about-moodle/trial/lms-trial-winter-2011-results/ (8.3.2014)

Finnish university actors have been interested in making decisions concerning educational technology in line with other universities, as instructed in the information management strategy by the Ministry of Education (2006). This would also support used systems' social and practical acceptability. Therefore, two national surveys on collaboration interests between universities and concrete actions for collaborative installations on web-based learning environments were conducted within the Finnish national IT-Peda network (IT-Peda network, 2007; Auer, 2007) in 2007. The results of the surveys expressed the overall interest in collaboration as information exchange between national actors, but individual interests in maintaining own installations of educational technology such as web-based learning environments though the software provided would be the same with other actors . When comparing web-based learning environments provided in the early 2000s (Lavonen et al., 2006; IT-Peda network, 2007), the international movement to change from Blackboard to Moodle was also visible at Finnish universities: during the period from 2003 to 2012 Blackboard was gradually replaced by Moodle, as summarized in Table 4.2 and Appendix A.

Table 4.2. Development of the use of web-based learning environment systems in Finnish universities from 2003 to 2012.

System	Year				
	2003[a]	2006[a]	2007 * current[b]	2007 *, 1st interest[c]	2012[d]
	Number of responding universities				
	18	18	38	25	15
	Percentages of universities				
Moodle	6%	50%	47,4%	52%	80%
Blackboard/WebCT	61%	56%	18,4%	20%	7%
Optima	28%	33%	18,4%	24%	20%
Others	17%	17%	15,8%	4%	0%
Unknown	22%	0%	0%	0%	7%

[a] Lavonen et al., 2006
[b] IT-Peda network, 2007
[c] Auer, 2007
[d] Appendix A
*) Percentages also include polytechnics.

In early 2012, only one university was using Blackboard, and it was planning to change to Moodle in the near future. Universities having used Optima seem to plan to continue to do so. Overall, in early 2012, universities were using their own Moodle installations. In 2007, two national surveys (IT-Peda network, 2007; Auer, 2007) investigated the interest of individual universities for a common, national Moodle installation. Based on the surveys, universities wanted to keep the maintenance of their educational systems in their own hands because of integration needs to other local systems, and expexted monetary issues. These results are in line with needs for system's practical acceptability. Common installations have not been discussed since. For all universities, a common installation with one centralized unit for technical maintenance and pedagogically oriented development would benefit all university actors instead of all universities resourcing similar maintenance and development in parallel with small resources. But local installations on the other hand support local compatibility to other systems, and personalization possibilities that may in the case of Moodle vs Blackboard have been one of the factors that have made universities select Open Source over a proprietary system.

4.4 Development of used systems at the University of Helsinki

At the University of Helsinki, web-based learning environments have been provided since 2000 with WebCT. Later, Basic Support for Cooperative Work (BSCW) was used. Because WebCT was combined with Blackboard in 2006, the University of Helsinki migrated from WebCT to Blackboard in 2007 (Koski-Kotiranta & Salo, 2008b; Lavonen et al., 2006). In addition, the so-called Platform Group (*Alusta-työryhmä*) recommended a strategic solution for selecting an open-source system besides Blackboard (Lavonen et al., 2006). National reports on using web-based learning environments in 2007 (Auer, 2007; IT-Peda network, 2007) illustrated the relatively strong interest in Moodle. In 2007, a Moodle 1.6 pilot was started in parallel with Blackboard use. In addition, the Confluence Wiki and the WordPressMultiUser blog engine were centrally provided in 2008 (Koski-Kotiranta & Salo, 2008b). Besides the centrally maintained installations of web-based learning environments, there have been separate Moodle installations in the department of Computer Science since 2005,[24] the department of Mathematics, and the Palmenia Centre for Continuing Education. All these have been phased out after the centralized Moodle installation was provided.

Before centralized educational systems were provided, the alternative was for organizations to implement their own solutions. For example, the

[24] Personal conversation, autumn 2011

University of Helsinki Open University[25] and the Palmenia Centre for Continuing Education developed together a separate system[26] to meet their needs. The Department of Computer Science has developed many systems for educational purposes, produced by the staff along with students. Systems needed for the management of teaching processes have been designed and used since the beginning of the 1990s. A course management system with interfaces for course registration,[27] student management, and course evaluation[28] has been used in different versions, and a student feedback system[29] has supported the systematic collection of feedback. A rule-based system for grouping students[30] supported pedagogical goals in courses that were based on group work or had common subjects. In addition to developing their own products, the Department of Computer Science participated in an international project with IBM to produce course material with Lotus Learning Space in the early 2000s (Laine & Kerola, 2002).

The Helsinki Institute of Information Technology HIIT developed three systems for specialized educational purposes: Educo (Kurhila et al., 2007), Educosm (Miettinen et al., 2003), and OurWeb (Miettinen et al., 2005). They were used in the teaching in the Department of Computer Science and offered perceived benefits for students' learning processes (Miettinen et al., 2003; Miettinen et al., 2005; Kurhila et al., 2007; Selänne & Kurhila, 2008). All systems were based on the pedagogical idea of collaborative knowledge construction with student-centered methods requiring active student participation, and they were used on courses consisting of group tasks. The systems provided environments for open, meaningful collaboration where students as peers benefited from and supported each other in their learning, thus complementing each other's strengths and weaknesses as a group. It could even be said that these systems formed, in one respect, an early ancestor of social media software with an emphasis on peer context, content awareness, and collaborative goals.

The Desmond study planning system was needed and developed at the Department of Computer Science to support students in designing their personal study plans (*henkilökohtainen opintosuunnitelma, HOPS*), especially in verifying their plans against existing alternatives, rules, and restrictions in the curriculum (Niklander et al., 2002; Rytkönen, 2003;

[25] Open University: http://www.avoin.helsinki.fi/oppilaitokset/verkko.htm#oppimisymparistot (8.3.2014)
[26] Palmenia: www.studium.helsinki.fi (8.3.2014)
[27] http://ilmo.cs.helsinki.fi (8.3.2014)
[28] http://kurki.cs.helsinki.fi requires authentication (8.3.2014)
[29] https://ilmo.cs.helsinki.fi/kurssit/servlet/Valinta (8.3.2014)
[30] http://www.cs.helsinki.fi/group/ilpo/ (8.3.2014)

Rytkönen & Niklander, 2003). It even included rules on teaching practices for the future, i.e., on courses that did not yet exist in the teaching database. A system that would focus student attention on concrete decision-making situations concerning their studies also emphasized the need for scheduling and thus supported students in developing their scheduling skills. The essential Desmond feature verified student plans based on all the received information, which also made the plans more reliable from the student perspective, increasing their awareness and certainty concerning what they were doing; students had more reliable information on their future study alternatives than would have been possible without Desmond.

The system increased interaction between students' future plans, department teaching planning, and student plans also served as preregistration for courses. Future study plans could assist study planners in concrete teaching organization needs, such as the sizes of lecture halls and number of exercise groups. As the implemented features required documentation of the department's so far unspoken rules concerning teaching practices, the Desmond implementation process also made the rules explicit and systematic. The Oodi national study register system[31] was expected to provide corresponding features[32] that gradually ended the use of Desmond by 2008. The wider importance of Desmond was in making people at the department level to think of and write down their practices, thus increasing their awareness and the enhancing systematic development of education. Developing such systems for every department would support their educational practices and provide curriculum planning with systematic methods.

All the presented systems fulfilled the educational purposes they were aimed for and served as pilots from the applied software development perspective. They have also illustrated that it was technically possible to implement systems that provided true added value to the educational processes at the department level in the early 2000s. As such, all the presented systems provided features that are still, ten years later, missing from centrally provided and corresponding systems such as Oodi and Moodle. If it is technically possible to implement value-adding educational technology, the reasons for why these are missing on the organizational level must be found elsewhere.

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[31] https://confluence.csc.fi/x/BYyE (8.3.2014)
[32] https://confluence.csc.fi/display/OODIsivut/OodiHOPS (8.3.2014)

5 Teachers using technology in teaching

This chapter presents theories, models, and categorizations about adopters and users of technology in teaching. First, the theory on the diffusion of innovations is presented in general. After that, the focus is on teachers, presenting theories, and models that are applied for the study. When investigating teachers as users of technology in teaching, this chapter reflects on the goals of the described decisions and actions.

5.1 The theory on diffusion of innovations

The diffusion of an innovation is about getting an innovation—a new idea, a system, or, e.g., a way of doing—adopted for use in a community. The theory of the diffusion of innovations was developed by Everett M. Rogers in the 1950s (Rogers, 2003, pp. xv-xxi) and later applied also to technological innovations, web-based systems, and methods (Davis, 1989; Egenfeldt-Nielsen, 2010; Jennings & Collins, 2007; Krzywacki et al, 2011; Liao & Lu, 2008; Mahajan, Muller, & Srivastava, 1990; Mölsä, 2006; Nichols, 2008; Prescott, 1995; Tabata & Johnsrud, 2008; Waldorff et al., 2008; Wong, Greenhalgh, & Pawson, 2010; Zhou, 2008). Using web-based methods can be considered an innovation for learners (Liao & Lu, 2008) after face-to-face learning methods, as well as a new way of using a familiar method or system (Krzywacki et al., 2011), can be an innovation for the users in question—the innovation's being a new idea does not require its being news; instead, it refers to the innovation's perceived newness to the person or institution (Rogers, 2003, p. 12).

For example, Waldorff et al. (2008) reported on the diffusion of a new web-based system used in personnel training and applied the theory to investigating how fast and well users adopted the program instead of previously used alternatives of face-to-face personnel training methods and static web pages. Information about the new web-based system was spread through email to all members of the community. After six months, the adoption rate was investigated, and it was found based on log data that the program had been used by 5% of the population. As illustrated in the example, there are four essential elements in the diffusion of an innovation: information of 1) *the innovation* gets through 2) *communication channels* over 3) *time* to 4) *recipients* (Rogers, 2003, pp. 11-38), where recipients become adopters after they have adopted the innovation for use.

Concerning the technology used in teaching, the innovation for individual teachers as adopters can be starting to use any technology in teaching after not having used anything, starting to use new systems, or starting to use a familiar system, with all of these providing a new way of supporting different goals. In this study, the focus is on teachers already using technology, especially the previously presented web-based learning environments Moodle and Blackboard and the change process from Blackboard to Moodle.

Innovations have general properties that are known to affect end-users' intentions on the possible adoption, i.e., when end-users evaluate whether to adopt or not. The innovation diffusion theory includes five innovation attributes: the innovation's relative advantage to the user, its compatibility, complexity, trialability, and observability (Egenfeldt-Nielsen, 2010; Rogers, 2003, pp. 15-17, 229-266). For example, students' perceived advantage and the compatibility of web-based methods is related to their intention to use web-based methods (Liao & Lu, 2008; Wong et al., 2010). Concerning technological innovations in particular, the two main innovation characteristics explaining end-user behavior in adoption decisions are the perceived usefulness and perceived ease of use of the innovation, as presented in the Technology Acceptance Model by Fred Davis (1989) and applied by later researchers (Liao & Lu, 2008; Prescott, 1995; Tabata & Johnsrud, 2008; Wong et al., 2010; Zhou, 2008). Compared to innovation attributes posited by Rogers, perceived usefulness corresponds to relative advantage and perceived ease of use quite close to complexity (Davis, 1989). Perceived usefulness describes the extent to which end-users believe that the innovation will help them perform better in their work or studies, and as such, it is closely related to perceived value. If the innovation is perceived to be potentially useful, it can still be rejected if it is perceived to be too hard to use.

Communication channels that possible adopters benefit from when they learn about the innovation can be divided by Rogers' method by their media type into mass media and interpersonal channels and by their distance in localite and cosmopolite channels. Mass media channels, such as newspapers and web pages, are most typically cosmopolite in their distance; they connect the adopter to external information sources. Their benefit is the ability to reach large audiences with little effort. Interpersonal channels refer to face-to-face communication situations, and they can be localite, such as peer discussions, or cosmopolite, such as visits to external communities (Rogers, 2003, p. 204-218).

Communication channels and the time needed to adopt are known to vary between groups of adopters based on the innovation diffusion theory. As this study focuses on teachers as users and adopters, different communication channels and scheduling issues are presented in the chapter to follow as variables of different adopter types.

The adoption process can be investigated at multiple levels: (inter)national, institutional, and end-user individual (Nichols, 2008; Zhou, 2008). A national perspective on the diffusion process of changing web-based learning environments from other systems to Moodle was presented previously, illustrating a diffusion process that required multiple years. The idea of preferring Moodle over other alternatives was spread nationally via established networks of experts to the organizational and individual levels over almost a decade. When Moodle was installed and ready to use in the adopting organizations, the innovation should further have been adopted by individual teachers in their teaching. Because of the multiple levels of the diffusion process, diffusion is often quite slow (Nielsen, 1993) and even incomplete (Rogers, 2003, p. 281).

The adoption process can result in desirable or undesirable consequences (Rogers, 2003, pp. 30-31, 442-446) on the organizational as well as the individual level. In adopting educational technology besides traditional teaching and learning methods, a desirable consequence at the organizational level would be that the selected educational technology is sustainably embedded (Nichols, 2008) in education. On the individual level, for example, applying the innovation for something it originally was not intended for, i.e., re-inventing (Rogers, 2003, p. 17, 20), provides signs of confirmation of the adoption process. Using a blog to publish ordinary web pages because of the easy editing interface it provides could illustrate this type of creative activity.

Typically, reaching the level of creative application in adopting an educational innovation on the organizational level requires a supportive culture to succeed and strategic decisions from the management (Nichols, 2008; Tabata & Johnsrud, 2008). The most impressive results are received with systematic change that expresses long-term commitment, good leadership, and sustainable embedding of educational technology (Nichols, 2008). Issues known to increase the rate of adoption and speed up the process include presentations about the opportunities that the innovation may provide for education (Krzywacki et al., 2011), training, and personnel support in the adoption (Krzywacki et al., 2011; Tabata & Johnsrud, 2008), where all the selected types of assistance are designed to decrease adopter frustration (Tabata & Johnsrud, 2008). The adoption processes are therefore well-designed and systematic (Nichols, 2008), and if systems are changing, these situations are also prepared for. In this way, the changes can proceed with short design periods.

Barriers that can slow down the adoption include time, commitment, and workload issues (Nichols, 2008; Tabata & Johnsrud, 2008) on a personal level. In addition, poor leadership and lack of personnel training on the organizational level affect the adoption of mainstream users (Nichols, 2008). As the characteristics of the innovation itself affect later user adoption more than early adopters (Jennings & Collins, 2007), the design of the assistance in the adoption process increases in importance for complex innovations.

Sustainably embedded educational technology includes a) well-selected systems used with b) pedagogically meaningful methods and c) aligned decision-making in the educational management. Therefore, selecting a suitable system for the educational goals is not enough; the teaching staff needs to be included in the adoption process. To succeed in all this, a change in attitude has also most likely taken place (Nichols, 2008).

5.2 Teachers as adopters of technology in teaching

Organizations and individuals who adopt an innovation can be described through their adoption behavior and their schedules in adoption. Adopters can be divided into common groups that have individual characteristics (Mahajan et al., 1990; Rogers, 2003, pp. 279-285). The original grouping of adopters by Rogers included five categories: 1) innovators, 2) early adopters, 3) early and 4) late majority, and finally, 5) laggards, based on their relative time of adoption. The groups of adopters are considered to create a normal distribution (Mahajan et al., 1990) where the innovators, early adopters, and early majority comprise the first half of the population and late adopters with laggards the second half of the adopting population (Jennings & Collins, 2007; Rogers, 2003, p. 281). This type of theoretical adoption development would, when drawing a cumulative figure of the adopters, yield an S-curve (Mahajan et al., 1990; Nielsen, 1993, p. 267; Rogers, 2003, p. 272-285).

Instead of using a theoretical though well-proven model of adopter categorization, adopter categories can also be determined generically by developing them based on adopter characteristics (Mahajan et al., 1990). The development model follows the idea of innovation diffusion by Rogers but instead allows variability in the number and size of adopter categories. Then, the numbers and sizes of the categories can be used to describe the development of the particular innovation in the unique context (Mahajan et al., 1990). Especially when investigating the adoption of technological innovations and their acceptance (Davis, 1989; Nielsen, 1993), the determination of individual adopter categories is useful. Then, the adopter categories can be described through needed characteristics, e.g., the frequency and amount of software usage and the differences in expertise in using the software. Adopters can be divided into categories based on the results, for example into four, early adopters, early majority, late majority, and laggards (Mahajan et al., 1990), instead of the traditional five categories.

Early adopters differ from the later ones (Jennings & Collins, 2007; Mahajan et al., 1990; Rogers, 2003, pp. 287-299) in a number of characteristics. Every adopter category typically uses different methods in learning about the innovation. Innovators typically hear about the innovation via their personal contact networks outside the community, i.e., via cosmopolite-interpersonal channels. As first adopters in their communities, they are like gatekeepers; the information about the innovation flows through them to the community. As such, they may not always be respected by their peers (Rogers, 2003, pp. 287-299; Ryymin, 2008). Early adopters are more likely receive information via mass media, including professional magazines (Mahajan et al., 1990) and managing by themselves (Rogers, 2003, pp. 287-299). They have the capability and motivation to cope with the uncertainty included in anything new. Early adopters who tend to use their active contacts in receiving information are, as opposed to innovators, often role models among their peers, even being opinion leaders. They are respected because of their deliberate, practical decisions, which give a sense of approval to the innovation for the later adopters. Again, as opposed to the two previous groups of adopters, those in the early majority often prefer using localite and cosmopolite interpersonal communication (Rogers, 2003, pp. 205-213), such as strong peer contacts and training, in their learning about the innovation. Their adoption period is relatively longer than that of the previous adopter groups' adoption period.

Late adopters want and need more information than early adopters in the decision-making process; they want to be more certain about the innovation to adopt. As part of the information confirmation, they want the information via subjective, localite-interpersonal networks instead of objective mass media. They rely on the subjective evaluation of their peers; they want to imitate and use existing best practices (Rogers, 2003, pp. 287-299). For late adopters, the adoption is strongly a social process. Therefore, from the different motivation types presented earlier, the social motivation is important to late adopters; they value what other people value (Biggs, 2003, p. 60-64) and follow people they trust. A late adopter would, e.g., want to participate in a peer meeting for teachers using educational technology, such as that organized at the University of Helsinki[33,34] or a seminar such as the Seminar on Blended Learning[35] to learn about best practices. Overall, the process before the adoption is shorter for early than for later adopters; late adopters typically use more total time in the process from the original knowledge to finish, so though they learn of the innovation at an early stage, they end up adopting later than faster adopters (Rogers, 2003, pp. 214-215).

Concerning technology innovations, early adopters are known to use larger amounts of software more often, and their expertise in using computers is greater than that of those in the later categories (Mahajan et al., 1990). They are typically venturesome and keen to apply technical knowledge (Rogers, 2003, pp. 279-299). On the other hand, end-users in general who are used to technology adopt and apply new technology more easily (Rogers, 2003, pp. 279-299; Tabata & Johnsrud, 2008). Teachers, being early adopters of educational technology, are described as interested in the technology itself, and they have visions on the pedagogical methods for the technology (Jennings & Collins, 2007). The early majority forms an important adopter group when investigating the rate of adoption on the organizational level. They form a large enough group that should secure the critical mass for the adoption; after the early majority, half of the community should have adopted (Rogers, 2003, pp. 279-299). Teachers who are part of the early majority can be described as pragmatists who want to perform their daily teaching duties with technology (Jennings & Collins, 2007).

The early majority is strongly interconnected in the community, and their word of mouth is important for the later adopters. The late majority adopts the innovation later than the average; often, their reason for adoption is peer pressure. For the late majority to adopt, most of the uncertainty concerning the innovation must have been cleared (Rogers, 2003, pp. 279-299), so late-adopting teachers want to adopt educational technology as complete packages and well-developed practices (Jennings & Collins, 2007). Last to adopt are the laggards; they are suspicious of and even resistant to the innovation, and their adoption process is typically long (Rogers, 2003, pp. 279-299). Teachers who are laggards with technology are not likely to adopt

[33] https://wiki.helsinki.fi/display/moodle/Moodlemaikkojen+miitit (8.3.2014)
[34] https://wiki.helsinki.fi/display/opekahvila/ (8.3.2014)
[35] http://blogs.helsinki.fi/sulop2013/ (8.3.2014)

educational technology at all in their teaching practices (Geoghegan, 1994; Jennings & Collins, 2007).

When investigating adoption on the organizational level, small units are often able to make decisions with lighter decision-making processes than large units, which must take into account more variables and various end-user needs than small ones (Nichols, 2008). Moreover, because of their position first in line, they must be able to deal with high amounts of uncertainty and even occasional setbacks. Later adopters must also be able to make more properly prepared solutions that take time. This affects the decision-making schedule, as uncertainty makes adoption slower (Rogers, 2003, pp. 279-299).

The relative innovativeness of individuals has an effect on the adoption process in the community. As people more easily rely on similar enough persons and social networks, the new innovation is more easily adopted when peers have already adopted. Teachers with peers who have already adopted are more likely to adopt themselves. Correspondingly, the word of an expert is not as easily trusted as the word of a well-known peer. Additionally, users who have experience of similar innovations re-use the innovation more easily and adopt new solutions earlier than others (Rogers, 2003, pp. 180-184, 279-299).

As adopting educational technology includes both personal adoption and pedagogical application skills to own teaching, end-users who perceive to have benefited from technology in their other duties adopt educational technology more easily in their teaching (Tabata & Johnsrud, 2008). This would also indicate that teachers who are already using one web-based solution in their teaching will more easily use another one than teachers who have not used any web-based solutions. Therefore, visualization of the existing perceived benefits from educational technology to potential additional adopters (Krzywacki et al., 2011) increases in importance. Additionally, adopters would transfer what they had learned (Löfström & Nevgi, 2009) to their everyday practices. Because of their previous experience, their value system would be ready for what is required (Rogers, 2003, p. 15) which makes the transfer easier.

If the innovation is incompatible with the users' value system, they first need to adopt a new value system, which makes adoption of the innovation slower. Two case studies in Finnish educational context (Hakkarainen, Ilomäki, & Lipponen, 1998; Mölsä, 2006) showed that adopting web-based methods in teaching emphasized teacher's pedagogical conceptions and highlighted its problems. Teachers with a constructive learning paradigm were more likely to adopt web-based methods than teachers with other learning paradigms. Informants in the studies were teachers in basic education who had teacher education, which could indicate that, among teaching personnel at universities with no systematic pedagogical education, pedagogical issues and challenges will be even more emphasized, and web-based methods would be adopted slowly.

5.3 Teachers as users of technology in teaching

In addition to categorizing users in the adoption of a system based on their characteristics (Rogers, 2003, pp. 279-299) or their expertise in using the system (Mahajan et al., 1990), users of systems in general can be described through their expertise. Users can be described as novice and expert users, but Jakob Nielsen (1993) went further, presenting three dimensions of end-user experience, also called the *User Cube*: 1) computer experience in general, 2) expertise on the system in use, and 3) knowledge and understanding of the task domain (pp. 31-48). These dimensions include corresponding scales of 1) minimal to extensive computer experience, 2) novice to expert knowledge of the system and 3) ignorant to knowledgeable about the domain. Applied to the educational settings of this study with web-based learning environments, the dimensions correspond to:

1. Experience on web-based learning environments in general
2. Expertise on the web-based learning environment in use
3. Pedagogical experience and routine

Type 1 experience includes experiences of previously used corresponding systems. Type 1 experienced users know what to look for when learning another system similar to one they are used to. For example, users who have used Blackboard can be expected to know what to look for in Moodle compared to users who start using Moodle as their first web-based learning environment.

Type 2 expertise is what the first presented division was about: expertise on the system in focus on a scale from novice to expert, including casual users. Casual users are more experienced than novices, but they never reach the knowledge and experience of experts because they use the system occasionally or with long breaks. Teachers who use the web-based learning environment in one course per year are casual, as are rarely needed use cases such as course evaluation. However, the experience of experts is relative; most users never reach the level of system knowledge that system administrators and educational developers have because of the large variety of features that modern systems include.

Type 3 expertise includes knowledge on the domain, which is pedagogy. The system is evaluated based on the idea of providing it for other field professionals who are provided with support in using the system. Accordingly, the system can be expected to be used with more or less understanding of the domain, i.e. pedagogy. When focusing on teaching personnel at the university level who in the first place are researchers and experts in their fields of science, these users cannot be considered one homogenous group of pedagogical experts. University teaching personnel are not required to possess pedagogical education, and so far, there are teachers using web-based learning environments in their teaching without pedagogical knowledge.

A versatile, qualitative view for illustrating advanced users' focus of thinking on teaching using technology in detail was aimed for in the study. Therefore, a model taking into account pedagogical, technological, and adopter perspectives was combined from three theories: Biggs's teachers' focus on teaching (2003, pp. 20-32; Biggs & Tang, 2007, p. 15-19), Nielsen's User Cube dimensions (1993, pp. 43-48), and Rogers' user innovativeness (2003, pp. 272-299) in adopting the provided educational technology. The categorizations were combined on two axes as dimensions of focus in teaching with technology. An overall idea of the model is presented in Figure 5.1.

The technological dimension on the X-axis is called *Technological innovativeness*. It applies previously presented theories by Nielsen and Rogers: Nielsen's User Cube dimensions 1 and 2 were combined with Rogers' user innovativeness. The scale starts from minimal computer experience and the adoption of technological innovations among majority or late adopters and reaches extensive computer experience overall and the innovative use or early adopting of technological innovations.

The pedagogical dimension on the Y-axis is called a *Pedagogical focus on teaching*. It applies the teacher focus categorization on teaching by Biggs, also representing dimension 3 of Nielsen's User Cube, the knowledge about the domain. The scale goes from a teacher-centered to a student-centered focus, where Biggs' levels 1-3 in teaching approaches are used.

In the model, the teacher focus on teaching with technology builds up from technological and pedagogical factors, where both factors should be in balance so that selected technical solutions are applied with suitable pedagogical motivation. Teachers with balanced pedagogical and technological awareness are capable of producing pedagogically suitable technical solutions that fit their level of knowledge. Teachers with strong pedagogical knowledge but not technological interest result in pedagogical imbalance. Their course designs support learning but could support it even deeper if the technology were properly used. Correspondingly, teachers with technological innovativeness but unmotivated or unfit pedagogical goals result in technological imbalance. They use more technology or different types of solutions than are suitable for their pedagogical skills. The use of technology might still yield good results.

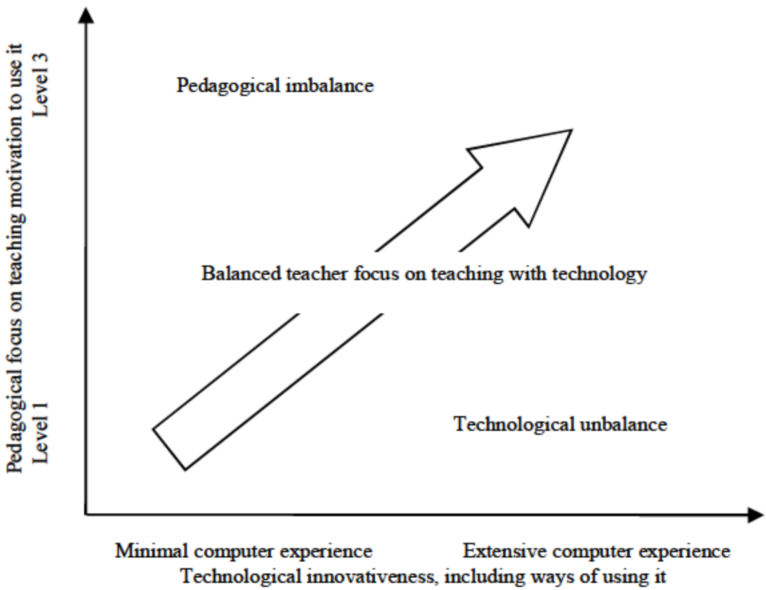

Figure 5.1. A model illustrating teacher focus on teaching using technology, as applied from Rogers (2003), Nielsen (1993), and Biggs (2003) by the author.

The overall goal of the model is to represent increased pedagogical awareness and fitness of the goals in the implemented teaching design. Pure unawareness or awareness in the dimensions is here not enough because it is possible for the teacher to illustrate different theoretical content knowledge and practical implementations.

5.4 The role of the organizational context

The social system structure and norms can support or disturb the diffusion. This can be different in different campuses, faculties, and departments. Management support is important for the adopters (Nielsen, 1993), preferably less top- and more middle-management support (Prescott, 1995). Attitude affects the schedule as well (Rogers, 2003); users with a positive attitude are known to adopt earlier and users with a negative attitude later if at all. As a consequence, the rate and schedule of adoption in a large organization may strongly differ between its units. For example, the University of Helsinki has 11 faculties with 36.000 students and 4500 teachers[36] at four campus areas located at long distances between each other. Therefore, organizational support for adopters is essential. At the University of Helsinki there are two important networks of experts, who are change agents and leaders in educational development in their units: e-learning support network (Löfström & Nevgi, 2009; Rytkönen & Kaivola, 2009; Rytkönen & Silenti, 2010) and senior lecturers in university pedagogy (Rytkönen & Kaivola, 2009; University of Helsinki, 2009a, pp. 53-54). These networks enhance the strategic goals of educational development (University of Helsinki, 2009b, pp. 48-51; 2009a, pp. 45-54) at the University of Helsinki, driving organizational development through a systematic diffusion of educational and technological innovations. The regular interaction with end-users needed for a thorough diffusion and adoption is possible in teachers' own units, such as departments and independent institutes, where e-learning specialists and senior lecturers in university pedagogy are located (Rytkönen & Kaivola, 2009).

Technology innovations have values (Rogers, 2003, p. 14; Wong et al., 2010), but as the innovations are often complex or perceived as complex, the value might not be clear to all users. Teaching personnel who are not used to using technology in teaching might therefore be uncertain about the adoption. If the innovation is simple to understand, adoption proceeds more rapidly.

[36] http://www.helsinki.fi/annualreport2012/ataglance.html (8.3.2014)

Trialability and observability of the innovation, i.e., ideas that can be tried and results that can be seen, create an experience that influences the individual's perception of the innovation. They reduce perceived complexity and thus assist in speeding up the adoption schedule (Liao & Lu, 2008; Rogers, 2003, pp. 15-17, 258-259). Therefore, organizational decisions, such as using Moodle in personnel training, provides teachers with opportunities to get acquainted with the innovation and form a personal opinion on it. This also enhances the quality of teachers' teaching by giving teachers a student perspective (Löfström & Nevgi, 2007a, 2007b, 2008; Parpala et al., 2009) and supporting them in their teaching development.

In the national Moodle adoption example, participants in the national Moodle circle brought the ideas they had learned about and considered useful to their universities for local adoption and thereby played an essential role in the adoption. Information about an innovation is often first heard from these types of experts, called change agents. They know more on the subject than people around them, and they proactively share their knowledge. Additionally, they are experts in the field, possessing systematic knowledge on the subject compared to end-users. When end-users hear from the innovation from change agents, the information is typically spread through discussion situations (Rogers, 2003, p. 6). The innovation might be one possible solution for the end-user's problem, but not the only one. It might be that the end-user is not interested in the innovation at first, but with time and further discussion opportunities, the idea of the innovation may turn positive. This newness for the end-user is caused by lack of information, which in turn causes feelings of uncertainty and unpredictability. If the idea of innovation diffusion is familiar, it can consciously be used as good practices when introducing a new technology (Prescott, 1995). With the repeated discussion opportunities, knowledge on the innovation increases, which supports decreasing uncertainty, and the change in attitude and decision-making becomes possible. This requires regular interaction with end-users.

Change agents are in the position of gatekeepers in the matters of their expertise in their communities (Rogers, 2003, pp. 368-387; Ryymin, 2008): they have outside contact networks that they receive information from, and they are capable of and interested in actively importing knowledge to the community. In this way, the change agents are like the waist in the hourglass: they receive, collect, and process the information to fit the community needs and share it further with the members of the community. Change agents support the adoption of desirable innovations and slow down the adoption of undesirable innovations (Rogers, 2003, p. 27). However, their positions in the peer communities often are not the central ones socially; rather, they are on the edge (Rogers, 2003, pp. 368-387; Ryymin, 2008) or even outsiders. This sometimes makes their work for the innovation adoption more difficult (Rogers, 2003, pp. 368-387), which makes the change agents in need of opinion leaders: socially central actors in the community who are respected by their peers. Opinion leaders have received their influential power by their post in the hierarchy or by their centrality in the interpersonal social model, and they are also familiar with the community norms (Egenfeldt-Nielsen, 2010; Rogers, 2003, pp. 368-387). Especially when looking at change agents who are technological innovators, they are known to be different from the opinion leaders (Ryymin, 2008). In departments and faculties of a university, opinion leaders might be, e.g., professors, because of their academic leading positions, and enjoyed public esteem by the teachers' social community, while, e.g., specialists in educational technology, as change agents, come from outside and can be different in knowledge and thus in social status.

A typical attribute of adoption is that potential adopters prefer to trust people similar to them rather than people much different in knowledge or social status. As innovators and early adopters perceive themselves as similar to change agents, they also easily adopt the innovation, but the majority and laggards feel themselves too different from the change agent (Rogers, 2003, pp. 368-387). These types of perceived differences can strongly affect the schedule and final rate of adoption and finally influence whether the innovation is a breakthrough or not (Jennings & Collins, 2007). Therefore, it is important for the change agents to resemble the adopters in the community; the more they are alike, the more they are trusted in their knowledge, and the innovation adoption they are working for may end in success. However, typically, change agents are strongly different from their clients (Rogers, 2003, pp. 368-387), as specialists in educational technology and senior lecturers in university pedagogy at the University of Helsinki might be.

One means of increasing the feeling of closeness between the change agent and the community members and to enhance the targeted adoption is to use aides and benefit from opinion leaders. For example, in enhancing the adoption of Moodle in departments, local teachers who already have used Moodle in their teaching could be systematically used as aides by department management in enhancing the diffusion. Additionally, change agents should use different approaches with earlier and later adopters (Rogers, 2003, pp. 368-387). To enhance late adopter adoption, change agents should create social value by enhancing the importance of the innovation more for later than for earlier adopters and find a late adopter who has already adopted to reassure his/her colleagues on the adoption.

Change agents are keen on forming networks. Reported experiences from networks and networking are positive (Rytkönen & Kaivola, 2009; Rytkönen & Silenti, 2010; [37]). To keep the network functional for its members, the network should be resourced with permanently employed members and a coordinator, and all participants should take responsibility for maintaining the network (Rytkönen & Silenti, 2010). Also concerning using Moodle in Finland, the national network of experts in the Moodle circle continued sharing information on best practices on how to use Moodle in a pedagogically meaningful way[38] and for further development[39]. Overall, networks of expertise can be considered an essential part in sharing information and knowledge on the development of technical and pedagogical issues concerning technology in teaching on the organizational level.

[37] http://www.hyvan.helsinki.fi/wernetti/oppisopimustoimistot_osana_verko.htm (8.3.2014)
[38] http://wiki.helsinki.fi/display/moodlerinki/Yliopistojen+Moodleen+liittyvien+koulutusten+benchmarking (8.3.2014)
[39] *Moodle migration plans in Finnish higher education*. https://wiki.helsinki.fi/download/attachments/68013899/Finnish-HE-Moodle2-plans-English.pdf (8.3.2014)

6 Goals of the study and research questions

When experts select an innovation on behalf of end-users, such as systems provided in organizations, making the selection requires understanding of the specific end-user group (Nielsen, 1993, pp. 10, 73; Smith et al., 2009). Consequently, selecting educational software requires an understanding of the characteristics of teachers as main users of the system (Nielsen, 1993, pp. 73-77; Rogers, 2003, p. 375; Smith et al., 2009), as well as an understanding of pedagogical goals and how learning happens. In addition, there are typically goals for system use from other stakeholders, as well. For educational systems at universities, educational developers are among these stakeholders. They are able to define the strategic goals for which the system should be used (Smith et al., 2009). They should be able to evaluate the system better than teachers, as end-users often do not have the perspective to evaluate what is good for them (Nielsen, 1993, pp. 11-77). Additionally, educational researchers cannot be expected to understand technological possibilities, so they probably cannot demand technical properties that teachers would benefit from. The context for using educational software systems includes four perspectives (Rogers, 2003; Smith et al., 2009) that affect the adoption:

1. End-user characteristics such as expertise
2. Goal for which the system is being used
3. Innovation characteristics
4. The organizational and social context

By investigating these four perspectives, it is possible to define a usage situation that describes the end-users with the system features and how they meet teachers' needs. To succeed, the systems used should include features that give teachers and students the possibility to concentrate on working to reach the learning goals instead of trying to find out what to do, when to do it, and with whom.

In this study, the focus is on teachers as end-users, and the listed perspectives are investigated as subordinates to the teacher perspective—through the teacher's eyes. Therefore, the perspectives that are used in the following are:

1. Teachers as users of technology
2. What teachers focus on in using technology in teaching

3. How the system characteristics are used
4. How teachers perceive the context of change and the organizational support for it

When viewing teachers as adopters of technology in their teaching, there are two phases: 1) teachers should first learn to use the system themselves, and 2) they should be able to apply their recent knowledge of the system to their knowledge of pedagogy and of the contents they are teaching. This results in combining pedagogical theoretical knowledge with web-based methods. Teachers should, in addition to using the systems themselves, make other users, i.e., students, use the system in a pedagogically meaningful way so that the process supports their learning. This requires the application of skills and a deep learning approach to result in success. If the teacher does not know what she wants and what she is doing, the results might be something else than the teacher had expected. In other words, teachers should be able to utilize gained information and increased knowledge in their own pedagogical development work.

Traditionally, teachers at the University of Helsinki have been able to decide whether to use any web-based methods in their teaching or not, and if they use them, what systems and features they prefer. The University of Helsinki has also traditionally provided a set of centrally maintained systems for educational use, but external systems could be used, as well. Within this context, some teachers have used Blackboard, some Moodle, other centrally maintained systems, and some external systems. This type of decision-making before adoption is voluntary and spontaneous (Rogers, 2003, pp. 28-30, 402-405). Therefore, when the University of Helsinki as an authority made the decision to phase out Blackboard and provide Moodle as the only centrally maintained web-based learning environment system in 2009, the university made the selection on behalf of all teachers using Blackboard; the decision-making was authority-based. As a consequence, teacher opportunities to make their own decisions decreased, and those who wanted to continue using web-based learning environments had to adopt another system and learn how to use it. This process was the starting point and the context of the study. In particular, the study focused on university teachers as the end-user group of web-based learning environment systems.

The main goals for the study were to find out how university personnel utilize technology in teaching and how they orient to changes in the technology they use for teaching. To reach the goals, the perspectives to study included University of Helsinki teachers as users of web-based learning environments, their perceptions on pedagogical and technological issues in the usage situations, and their perceptions on technology change. The four research questions, based on the research goals, are presented below with operationalization:

1. How can University of Helsinki teachers be described as users of technology in teaching?
    1.1. How much experience do teachers have in using web-based learning environments?
    1.2. How versatile is teachers' experience in the system they are using?
    1.3. How ongoing is the usage?
2. What do experienced users focus their thinking on in using technology in teaching?
    2.1. What do experienced teachers focus their thinking on pedagogically and technologically, and how are they combined?
    2.2. What factors describe different focuses?
3. How do the users utilize technology in teaching?
    3.1. What features do teachers utilize in teaching with technology?
    3.2. What kinds of features do teachers perceive as essential in teaching with technology?
    3.3. What kinds of features do experienced users utilize when teaching with technology?
4. How do users adopt changes in technology used in teaching?
    4.1. With what kinds of scheduling do teachers approach the change?
    4.2. What kinds of communication channels do teachers use to become familiar with the new technology?
    4.3. What kinds of factors do university teachers expect to challenge the process?
    4.4. How do experienced users orientate to the variety of technology used in education?

The results are expected to provide information and models that deepen the theories used and increase the understanding of users in using and changing web-based learning environments at the University of Helsinki. They, in turn, are expected to provide support to educational and educational technology development on the organizational, faculty, and departmental levels in supporting teaching staff in their teaching at the University of Helsinki. Additionally, the results may raise discussion on the implementation and follow-up of centrally made decisions.

7 Research methods

To reach the goals of the study, users were studied to determine how they used the systems provided for them (Nielsen, 1993). The practical interest in the situation described in previous chapters with a pragmatist worldview motivated the selection of a mixed-methods approach for the study (Creswell & Plano Clark, 2011, pp. 1-52). The informants were studied using questionnaires and interviews, both query-based techniques (Zaphiris, Ang, & Laghos, 2009). Data were collected with questionnaires from 2008–2009 and with interviews conducted in January 2011. The data were analyzed using qualitative and quantitative content analysis methods (Cohen et al., 2011; Silverman, 2006) to define factors that describe teachers in using technology in teaching (Nielsen, 1993; Zaphiris et al., 2009). Further, teacher perceptions on methods in the adoption process and organizational support were studied. This chapter presents the selected research methods along with the process, participants, analysis, and quality of the study.

7.1 Data collection process

The University of Helsinki is the largest and leading university in Finland, with 36,000 students and 4,500 teaching staff members in 2012.[40] It provides research and education in multidisciplinary fields of study under 11 faculties located in four campuses. Fields of sciences in humanities are located at the city campus, science on the Kumpula campus, and bio and life sciences at the Viikki and Meilahti campuses.

In 2008, the University of Helsinki provided Blackboard and Moodle in parallel to be used as web-based learning environments. Additionally, there were a number of department and institute Moodle installations based on their specialized needs. A desire to clarify the provided options and reduce the total number of parallel options was expressed by University of Helsinki teachers and students.[41] Blackboard and Moodle were maintained by IT Services, which was not motivated to maintain two systems in parallel use, when both required resourcing (Koski-Kotiranta & Salo, 2008b). Additionally, the Blackboard version needed to be upgraded, and the license

[40] http://www.helsinki.fi/annualreport2012/ataglance.html (8.3.2014)
[41] http://blogs.helsinki.fi/signaali-blogi/2011/04/13/jarjestelmasta-toiseen-osa-3-toiveiden-mukaan-ollaan-menossa/ (8.3.2014)

fee was rising. At that point, the discussion about moving from two parallel web-based learning environments to one was started, ending with the selection Moodle and phasing out of Blackboard. The decision followed the trend in Finnish higher education, as Moodle became the leading solution used in universities nationwide. The change process included three steps, presented in Table 7.1.

Table 7.1. Steps in the decision-making process that ended with the phasing out of Blackboard.

Step	Decision	Survey goal	Target group	Survey results
1	Reduce the number of systems from two to one	Blackboard or Moodle?	Teachers using Blackboard; teachers using Moodle	Moodle exceeds Blackboard based on the results
2	Moodle is selected	How is Blackboard used?	Teachers using Blackboard	Usage numbers and methods
3	The phase-out schedule and resources	How do teachers change to Moodle?	Teachers using Blackboard	Schedules and needs

At each step, the change process was specified, and to serve end-users' needs, each decision was followed by an end-user survey that expressed the end-users' perspective:

- **Step 1:** In spring 2008, the IT management committee at the University of Helsinki decided that one of the two web-based learning environments in parallel use would be prioritized as the target for development, and the other one would be phased out. To assist in the selection, a survey on end-user perceptions was conducted by the IT department and Educational Technology Centre where Olli Salo was responsible for the survey design. The goal of the survey was to compare user experiences and opinions on the two web-based learning environments, Blackboard and Moodle 1.6, to obtain information for further development and to see which system was more favorable. In this case, teachers would represent the end-users since students would use the systems their teachers select; both systems were teacher-selected in that students do not use them without teachers being active. The results provided useful information on teacher working methods, needs, and habits in the use of the target systems. A summary of the results was written (Koski-Kotiranta & Salo, 2008a) but was not published though it should have been, and thus the respondents were not informed about the results.

- **Step 2:** In September 2008, the IT management committee made the decision that Moodle would be the future web-based learning environment at the University of Helsinki; correspondingly, the use of Blackboard would be ended. The decision was published on the Blackboard support site blog in Finnish. Since a large number of teachers were using Blackboard, needing to migrate to Moodle, there was going to be a big workload. Therefore, a survey on Blackboard teacher needs was conducted in the autumn of 2008 by Educational Technology Centre, where Mari Jussila was responsible for the survey design. The goal of the survey was to collect qualitative and quantitative information on Blackboard course area contents and teacher needs in the change. Based on the results, the overall need for support and workload on the change support personnel was estimated. Likewise, recommendations and instructions on what system to select for future teaching to satisfy the pedagogical needs expressed by the survey respondents would be provided. A summary of the results was published in the Blackboard blog in Finnish.
- **Step 3:** In late autumn 2008, the IT management committee discussed, based on the results of Survey 2, the actions and support that the change in learning environments would require. The schedule for the phasing-out was designed as a gradual reduction of end-user permissions and educational possibilities. As part of the change support actions, a third survey was conducted in the autumn of 2009 where the author was responsible for the survey design. The goal for the third survey was to collect information on teacher plans and schedules in adopting the change to design training and instruction tailored for the expressed needs. Based on the results of Survey 3, the planned support actions were adjusted, specified, and targeted, personnel training was tailored to faculty and specific departmental needs, and instructions on the web were further developed. The outline of the Survey 3 results was published on the Blackboard blog in Finnish and sent with the most essential instructions to all respondents by email.

In steps 2 and 3, the previous step survey responses were also benefited from. Requests to respond to the questionnaires were sent by email directly to users who had instructor, designer, or teacher roles on at least one course area in the corresponding web-based learning environment. Additionally, a request to respond to the third survey questionnaire was published on the Blackboard support blog in Finnish. The surveys included four questionnaires: Survey 1 included two questionnaires, one for users of each system, Blackboard and Moodle, that included corresponding questions with only the name of the system differing. Survey 2 and Survey 3 included one questionnaire each. All questionnaires included three types of questions as suggested by Zaphiris et al. (2009): multiple-choice questions, questions with Likert scales, and open-ended questions. The questionnaires were only made in Finnish mainly due to oversight..Most respondents also answered in Finnish, with some Swedish and English exceptions. The translated survey questions are listed in Appendix B. All survey questionnaires were implemented in the Elomake[42] web-based questionnaire system. The responses were exported from Elomake to Microsoft Excel for analysis.

The interviews were conducted after the change process and analysis of the questionnaire data in January 2011. Interview informants were contacted in person, by phone, or by email. In this first contact, informants were told that the interview would concern their experiences with web-based learning environments and that the reason was the author's PhD study. All the contacted informants agreed to be interviewed and thus the number of interviewees was 11. All interviews were conducted in Finnish by the author, and they lasted from 45 to 100 minutes. All interviews were recorded and transcribed mostly on the interview day by the author. The transcriptions were written verbatim because the contents of the discussions in the interviews were the focus of the study, not the discussion situation itself. All discussion themes were included in the transcripts because everything was considered essential except occasional interruptions and meta-discussions, as suggested by Ruusuvuori, Nikander and Hyvärinen (2010). The transcriptions were not translated into English; only the quotes presented in the results were translated. The interview transcriptions were imported into Atlas.TI, which was used for the qualitative analysis.

The selected interview themes were specified based on the existing survey results and system data. They focused on interviewee experience, goals, impacts, and perceived values in using web-based learning environments. The first interview served as a pre-interview, as recommended by Hirsjärvi and Hurme (2001, pp. 72-73). After the first interview, a list of supporting questions for each theme was specified to assist the interviewer, and the interviewees were provided with a paper note about the interview perspectives to view during the interview as a memory refresher, as suggested by Alastalo and Åkerman (2010). The list of supporting questions was used to ensure that the same themes were covered with all interviewees.

[42] http://elomake.helsinki.fi/ (8.3.2014)

Additionally, the specific questions under the themes were personalized based on informant background information (Alastalo & Åkerman, 2010), selection criteria, and responses in the interviews (Creswell & Plano Clark, 2011, p. 290) to obtain various and rich data. The interview frame with themes and the paper note used are listed in Appendix C.

The interviews provided insight (Zaphiris et al., 2009) in the interviewees’ experiences, concerns, and ideas for the development of the provided systems and their support. To support the interview goals to provide more in-depth understanding of selected survey results by collecting information on experienced teacher perceptions (Creswell & Plano Clark, 2011, pp. 173-174), a semi-structured theme interview (Hirsjärvi & Hurme, 2001, p. 47-48; Zaphiris et al., 2009) with open-ended questions (Creswell & Plano Clark, 2011) was selected. The interview strategy was to use narrative questions to foster a free and open discussion atmosphere (Alastalo & Åkerman, 2010). Keeping the relaxed atmosphere was preferred instead of pressuring to continue discussing a subject in cases where the interviewee tended to change subjects or otherwise was perceived to have said enough (Alastalo & Åkerman, 2010; Kuula & Tiitinen, 2010), though the desired depth of information might not have been received (Alastalo & Åkerman, 2010). Instead, questions that allowed the interviewees to present their perspectives were used—that was the reason that the specific interviewees were selected. To better understand the meanings of an interviewee, the interviewer could ask clarifying questions, sum up, or interpret with synonyms what the interviewee just had stated, which they could react to by agreeing or disagreeing. This can be called a self-repairing interview method (Hirsjärvi & Hurme, 2001, p. 137). The interviews were all one-on-one (Creswell & Plano Clark, 2011, p. 177; Hirsjärvi & Hurme, 2001, p. 61; Zaphiris et al., 2009) to receive personal experiences and avoid the influence of the other interviewees in the responses.

7.2 Informants

The target group for the surveys was the teaching staff members at the University of Helsinki who were using Blackboard or Moodle when the surveys were conducted. As Blackboard was in wider use than Moodle in 2008, the number of recipients of the first Blackboard questionnaire was larger than the number of the Moodle questionnaire: between 800 and 900 teachers were using Blackboard, while below 400 teachers were using Moodle. Additionally, as Moodle was selected as the prioritized system after

Survey 1, the only target group for the two subsequent surveys was Blackboard teachers. Altogether, about 700 responses were received in three surveys that included four questionnaires, with an average response rate of 23%. An overview of the respondent numbers is presented in Table 7.2.

Table 7.2. Numbers of respondents in the study.

Questionnaires	Recipients	Respondents		Response rate
1. Blackboard, spring 2008	858	145 **	(151*)	16.9%
2. Moodle, spring 2008	376	68 **	(69*)	18.1%
3. Blackboard, autumn 2008	870	181		20.8%
4. Blackboard, autumn 2009	882	303		34.4%
Questionnaires in total	2,986	697		23.3%
Interviews	11	11		100%

* with identical double answers
** with responses of four respondents in both

Selected based on the survey results, the interview informants were expected to represent the advanced user group defined in research question 1. They represented more experienced users of web-based learning environments than their colleagues in their communities and at the same time a variety of knowledge in planning and teaching with various web-based learning environment systems covering a period of multiple years at the university level. The group was selected based on their expected knowledge on the subject (Alastalo & Åkerman, 2010), which strongly reduced possible options. To reach maximal variation (Creswell & Plano Clark, 2011) within the scope, the interviewees should represent the variety of users (Alastalo & Åkerman, 2010), i.e., in this case the campuses and faculties at the University of Helsinki, which made forming the discretionary and purposeful sample (Creswell, 2003, p. 220; Creswell & Plano Clark, 2011, pp. 173-174; Hirsjärvi & Hurme, 2001, pp. 58-59) even more challenging. Informants with versatile teaching experience in Blackboard and Moodle, including the change process, were needed in the sample, in addition to informants with experience in other environments used at the University of Helsinki.

The selected interviewees possessed knowledge of using web-based methods in teaching from the practical, teacher support, and department-level perspectives. All the selected interviewees had used web-based learning environments for years. Additionally, they possessed various amounts of pedagogical education from educational sciences, general teacher qualification, and university pedagogy courses. Some participants had no pedagogical education at all. Correspondingly, the interviewees had no subject education in technology except the comparative view on computer science. Based on background education, interviewees were categorized into representatives of natural, bio, and human sciences. Since the target group fulfilling the criteria was small, a more specific description of the informant selection criteria than presented would decrease the informants' right to be unidentified (Hirsjärvi & Hurme, 2001, p. 20).

7.3 Data analysis

Responses to the questionnaires were analyzed using descriptive statistics with frequencies, percentages, and cross tabulations to present the results of the multiple-choice responses (Cohen et al., 2011). Open-ended responses were categorized into themes of issues or types of answers, and the numbers of instances were counted (Hirsjärvi & Hurme, 2001, pp. 172-183; Silverman, 2006). The author made the categorization independently, after which identified categories and categorizations were discussed with the mentor.

All information identifying the respondents was excluded from the responses. Faculty information was excluded since the number of respondents in most faculties were too small for quantitative analysis. Instead, faculty information was converted to campus information so multiple faculties could be combined from the Viikki and city campuses. The independent variables are listed in Table 7.3.

Table 7.3. Independent variables used in the surveys.

Survey	Independent variables
Survey 1	Name of the learning environment
	Campus information
Survey 2	Campus information
	Number of features used
	Selected support methods
Survey 3	Campus information
	Change schedule
	Previously used support actions

The interviewees were considered experts with knowledge and opinions on the subject. In addition, they were research objects whose expertise was summarized with content analysis (Alastalo & Åkerman, 2010; Cohen et al., 2011). The analysis focused on teacher characteristics as users of web-based learning environments along with perceptions on the systems used and perceptions of the organizational role in using web-based learning environments. The latter was not included in the interview themes but came up as natural part of each interview.

The interviews were categorized as theory-based by using the two defined dimensions of teacher focus in using technology in teaching, presented in Chapter 5, so that each profile was categorized (Creswell, 2003, pp. 190-195; Hirsjärvi & Hurme, 2001, pp. 172-183). Each dimension included three categories:

- Pedagogical focus in teaching with Biggs' (2003) categories Level 1, Level 2, and Level 3 categories (pp. 11-33)
- Technological innovativeness with categories Minimal, Moderate, and Extensive, combined from Rogers (2003) and Nielsen (1993)

As each profile was categorized on two dimensions and dimensions were combined, the combination was a 3x3 matrix with teacher expertise, as presented later in the results. Profiles were categorized by the author independently after which they were verified with the mentor with the help of example transcriptions.

Quotes were selected for the results based on the categorization. Concerning teacher perceptions on systems and the organizational role, related descriptions were coded and the variation of descriptions was explored. As frequency does not equal importance in qualitative analysis (Cohen et al., 2011), frequencies were not counted. In the interviews used to deepen the survey results, quality was in focus instead of quantity, with an emphasis on author expertise.

7.4 Quality of the study

As a system administrator, the easiest way to investigate end-user behavior in using the systems is to monitor automatically collected system log data. Moodle system log data on course area contents such as activities and blocks provide up-to-date information on the number of selected contents as well as the number of course areas that include the selected type of content. These data were used in monitoring amounts and differences of use between faculties, even upon request by support personnel, as for the Open University[43] at the University of Helsinki. However, the Blackboard version installed at the University of Helsinki was a "black box" concerning statistics; as a commercial product, the statistical elements would have required the purchase of an extra package, and that was out of reach due to

[43] https://moodle.helsinki.fi/course/view.php?id=3431 (8.3.2014)

financial issues. The statistical perspective on the use of various Moodle modules gave an overall picture and a good starting point concerning the methods that teachers preferred to select. However, via system log data, it was not possible to understand why teachers used the selected alternatives and learn about their pedagogical working methods. Additionally, log data does not record processes and development. The need to know more about user motivations in using specific solutions among a number of alternatives, combined with the total lack of Blackboard system data, motivated the use of questionnaire data to obtain the information needed.

Based on the questionnaire data implemented for the change process from Blackboard to Moodle at the University of Helsinki, the respondents could be divided into categories by type of use and needs, and in this way, the expertise of the teachers as end-users in using web-based environments in the university context could be defined. However, even with large numbers of responses, the data received with questionnaires did not present teacher motivations and thinking on their needs in using web-based learning environments. To delve deeper into the subject and to complement the results from the questionnaires and system log data, experienced users were interviewed, as suggested by Hirsjärvi and Hurme (2001, pp. 28-36) and Creswell and Plano Clark (2011, pp. 1-18). The aim of the interview was to discuss the subject on a level that was not possible through survey questionnaires and to present awareness on the motivations behind the decisions that teachers made when designing working methods and selecting web-based environments for their teaching. In addition, valuable historical and context information was gathered, along with teacher perceptions (Creswell, 2003, pp. 186-188), though everything was not used in this study.

When facing a major change in their teaching environment in adopting innovations, interviewees were expected to pay attention to differentiators (Aaker, 2003) in the system features and opportunities in methods they were used to. They were hoped to have recent comparative experiences in environments close to each other in usage intentions and methods. A comparative situation reveals pros and cons from compared systems, and the comparison situation expresses issues that are relevant for the evaluator. Additionally, the situation may reveal evaluator expertise and perspective on the object of evaluation. Therefore, all three perspectives, those of teachers, the system, and the adoption process were needed.

The selected data types complemented each other in the total information production process, supported the solving of the research questions, and enhanced the interpretability of the results (Hirsjärvi & Hurme, 2001, pp. 38-

39). The original overall view presented by the log data was explained with the help of questionnaires and interviews, and the log data helped in understanding the results of the questionnaires on a larger scale. The interview themes were based on results received with more general methods, and the interviews could therefore be targeted at the remaining problematic areas (Alastalo & Åkerman, 2010). Reliability issues address care and quality in the collection methods and data, also affecting the quality and generalization of the results, and validity concerns data and result credibility, i.e., whether they can be relied on (Ruusuvuori et al., 2010). Triangulation of methods in data collecting and the general consensus of the results with separate collecting methods within a three-year time frame indicate the relatively strong credibility of the results and support reliability (Hirsjärvi & Hurme, 2001, p. 189; Creswell & Plano Clark, 2011).

Though the research context was Finnish higher education at university level, the research focused on University of Helsinki with all research targets being University of Helsinki personnel. No sampling or randomization was used among the population which would have made statistical analysis possible (Vehkalahti, 2008; pp. 42-44). The survey response coverage was 1/5 of the population, which affects the reliability of the results. Additionally, interviews were small in number. Based on the context and research settings, the results are not generalizable to the overall situation at University of Helsinki, nor to university-level teaching in Finland in general, and especially not to polytechnics or comprehensive education because of their stronger requirements for teacher qualifications. At Finnish universities, teaching personnel are not required to have a degree in education, as is the case in education at all other levels in Finland.

The questionnaires were produced by individual experts, validated by discussing or piloting them with colleagues, and they were edited according to the feedback to obtain answers to the relevant issues. Survey 3 questionnaire Q4 was piloted on one possible respondent who did not respond to the published survey, to get end-user feedback. The respondents answered the questionnaires with their own names, which was considered to enhance the reliability of the data. In addition, email and faculty and department information was collected to enable the researcher to contact respondents and prepare support actions for the change. The surveys were conducted to promote respondents' working goals, and the respondents were encouraged to express their needs concerning the change. Thus, they were expected to know what they were responding to. The data was considered reliable for the intended purpose. The results were visible for and used by the group of experts at the Educational Technology Centre and IT Services at the

University of Helsinki in preparation for support actions for the respondents, and they were not revealed to outsiders. The contact information will be disposed after the study.

The questionnaires were published only in Finnish, though there were a number of foreign teachers at the university. This may have caused some teachers from the target group to refuse to answer. Since all the questionnaires had the same flaw, there is a minor systematic bias in the results. Still, some teachers responded either in English or Swedish to the Finnish questions, and only one teacher wrote that she did not understand all the questions. Providing the questionnaires in both English and Swedish would have increased the reliability of the results and been in line with the university's multilingual strategy. The interviews were all conducted in Finnish to enable the researcher to use the same main concepts with all informants, i.e., to avoid possible faults in shades of interpretation in different languages (Hirsjärvi & Hurme, 2001, p. 53). Informants who could have been interviewed in other languages agreed in advance on the use of Finnish. This was considered to decrease the validity of the results less than using different languages with different informants.

In spite of the use of properly motivated selection criteria aiming at an unbiased interview sample, the final decisions on informant selection were made by the author alone, increasing the risk of systematic bias (Hirsjärvi & Hurme, 2001, p. 60). The decisions could have been verified with the help of colleagues at Educational Centre for Technology or in the e-learning support network. Based on the author's expertise on the subject with awareness of the university-wide situation as a whole, it was considered that the core of the group of informants would have been the same even with collegial support. To better protect the interviewees' right to remain unrecognized, the selection of informants with as little assistance as possible was preferred, though there might have been some even more preferable unknown informants, and this decision might have decreased the validity of the results. The interview situations were relaxed, and all the interviewees felt motivated concerning the subject.

The original purpose of the surveys was to support internal decision-making from different perspectives in the process of changing from Blackboard to Moodle. The questionnaires were not designed to be used as a whole, so comparability was not supported between questionnaires. Three specialists designed the questions based on their goals at times being. Therefore they used varied concepts as synonyms with shades of meanings without definitions. Additionally, the background questions presented in

Survey 1 were not included in Survey 2 and Survey 3. As a consequence, an overall comparison on expertise or development between surveys was not meaningful, and the teachers' working strategies in Survey 3 could not be compared to the teacher profiles in Survey 1.

With the provided questionnaire data, the responses to many questions could be classified but not ordered, so only counting numbers of responses in each class was possible. No other quantitative analysis would have been meaningful, and no valid conclusions could have been drawn. Previous experience was an open-ended question, and no qualifications on expertise were required. The number of properties had the same qualification issue, where the experience could range from student experiences or one-time testing to years-long educational use. The simple quality of the data obviously caused a decrease in reliability (Nummenmaa, 2009), and only coarse scale differences were observed.

Survey 1 included two questionnaires. Respondent expertise was profiled and compared between the two questionnaires. The profiles were compared in previous experiences on web-based learning environments, in the numbers of used properties, and in numbers of course areas. In the interpretation of the results, of note is that the concept of the web-based learning environment was not defined in the questions, nor was the expected quality of experience. Since a majority of respondents merely listed system names instead of including explanations on the quality or quantity of experience, no answers were excluded from these results; any experience was presumed to increase experience. This affects the interpretation options of the results. Every mentioned environment was counted as one experience, without weighing or prioritizing some experiences over others. Every new system experience provides more insight for the view, so every experience was accounted for.

The surveys were conducted to receive technical information on the system in focus. Therefore, it seemed natural not to ask further questions concerning the pedagogical issues. However, on the other hand, as the systems were used in a pedagogical context and for pedagogical purposes, it would have been important to further evaluate the environments from the pedagogical perspective to support the achievement of pedagogical goals. Partly to fill this gap, the interviews were conducted. Additionally, it would be important to continue with this type of survey but emphasize the pedagogical perspective instead.

At least one of the web-based learning environments, Blackboard and Moodle, had been used on all campuses during the study period. Questionnaire response numbers were emphasized on Blackboard, with three questionnaires, compared to Moodle's one questionnaire, and over half of the responses to every Blackboard questionnaire were received from the Viikki campus. The questionnaire results indicated strong Blackboard use at Viikki, which was verified by combining the number of respondents with system login data on teacher activity in Blackboard. The summary is presented in Figure 7.1, which illustrates the ongoing trend of using Blackboard on the campuses: Blackboard had the most users on the Viikki campus and the fewest users in Meilahti. Overall, the majority of Blackboard users were from Viikki, and they were the most active to the end of the phasing-out.

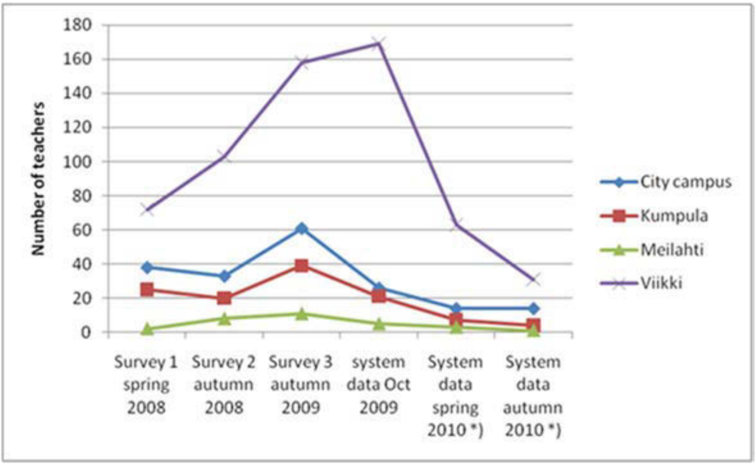

Figure 7.1. Survey responses and system log data representing relative Blackboard use from 2008–2010 on four campuses. System log data presents teacher user logouts during October of 2009. * The system log data for 2010 presents numbers of active teachers who had logged out multiple times during the period.

Moodle usage increased after Survey 1 in 2008; Blackboard teachers adopted Moodle, and new teachers adopted web-based methods in their teaching. The Questionnaire 2 results from 2008 concerned Moodle version 1.6, which was piloted to receive comparative experiences for Blackboard. Later, when Moodle was adopted into common use, it was provided in version 1.9. To verify the questionnaire results, questionnaire data on the properties used from 2008 were compared with Moodle system data from early 2012, as presented in Table 7.4. The order and relative popularity of the properties used resemble each other; distributing material and discussion forum are the most typical ones in 2012, followed by submission of assignments at a secondary level of use and the rest of the properties at a marginal level of use. This can be considered to support the reliability of the survey results.

Table 7.4. Survey 1 results in comparison to Moodle system data 8.4.2012 with 6,252 course areas.

Feature	Data source		
	Survey 1, Blackboard	Survey 1, Moodle	System data, Moodle
	Percentages of respondents or course areas		
Distributing material	82%	87%	87% *)
Discussion forum	50%	78%	100%
Submission of assignments	52%	44%	45%
Automatic assessment	15%	16%	9%
Chat	6%	13%	5%
Vocabulary	5%	9%	4%
RSS feeds	1%	1%	
Wiki			3%
Lesson			2%

*) Including external links asked separately in the survey

The interview data compared a variety of systems. All interviewees having experience in at least Moodle emphasized the 2011 Moodle version, 1.9. The first questionnaire data were collected three years before the interviews. The time frame of three years can be considered a long period in educational technology and therefore in educational technology research as well.

8 Results

This chapter presents the results of the study in the order of the research questions listed presented in Chapter 6. First, a profile of teacher expertise in using web-based learning environments is presented with the help of the questionnaire results, after which the variety of focus on using technology in the teaching of experienced teachers is illustrated with the help of interview data in the second subsection. The third subsection presents how teachers use the selected systems and teachers' perceptions on essentials in teaching. The chapter ends with presenting teachers' orientations to a change in technology used in teaching.

8.1 Teachers as users of technology in teaching

This section presents results for research question 1. Teachers' experience is illustrated in a quantitative way through applying the idea of Nielsen's (1993, pp. 43-48) three User Cube dimensions of user experience, as presented in Chapter 5.3. For each dimension, the respondents were divided into a majority, illustrating the mainstream type of use, and a minority, illustrating the advanced type of use. Further, the experience profiles of advanced teachers using Blackboard and Moodle are presented. The results discussed in this section are based on questionnaire data with the number of respondents as presented in Table 8.1.

Table 8.1. Number of respondents in the results presented in this section.

Questionnaires:	Survey 1, Blackboard	Survey 1, Moodle
Respondents	145	68

8.1.1 Previous experience

To answer research question 1.1, Nielsen's (1993) User Cube dimension 3, Knowledge about the domain, was used to illustrate previous experiences in using a variety of educational technology in teaching. Among Blackboard and Moodle users, 70% mentioned previous experience in web-based learning environments and installations other than the one in focus. The remaining 30% of respondents either did not have previous experience or did not respond to the question. Because of the open-ended question formatting style, the blank responses were interpreted as missing data. Figure 8.1

illustrates the profiles of teachers' previous experience on web-based learning environments, reflecting the largely similar history of Blackboard and Moodle teachers as users of web-based learning environments.

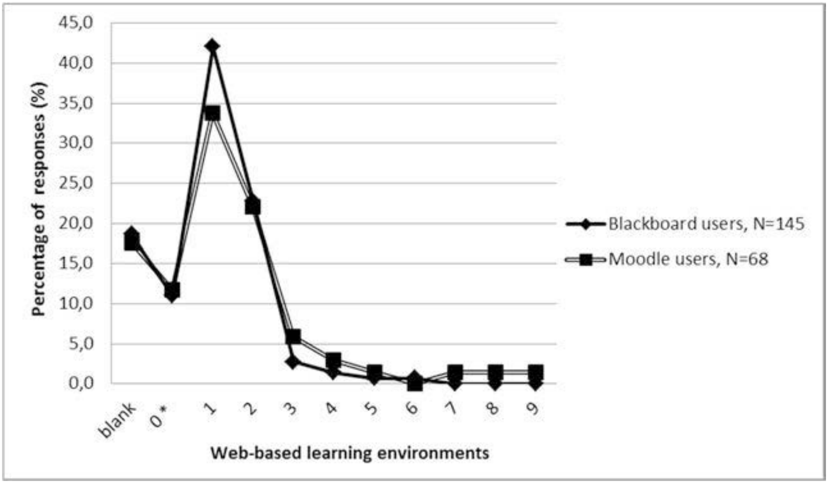

Figure 8.1. Blackboard and Moodle teachers' experience in we-based learning environments, 2008, Survey 1. * 0 systems included responses that indicated no experience; blank responses were interpreted as missing data.

To investigate the previous expertise further, the most frequently mentioned systems were collected in Table 8.2.

Table 8.2. Most Blackboard and Moodle users mentioned web-based learning environments prior to the one in focus, 2008, Survey 1.

Previously used systems	Blackboard users	Moodle users
	Percentage of respondents	
Blackboard	0%	16%
WebCT	54%	32%
Moodle *	10%	10%
BSCW	19%	37%
Optima	8%	7%
Others	17%	24%
	Number of systems mentioned	
Total	14	19

* Moodle users: elsewhere

According to the results, Blackboard and Moodle users had gained various types of expertise in web-based learning environments. Moodle users had proportionally somewhat wider experience with a larger variety of systems, while the majority of Blackboard users' previous experiences were on one system, WebCT. The logical explanation of the large WebCT history, especially for Blackboard users, was the fact that WebCT was the predecessor of Blackboard at the University of Helsinki; many respondents had migrated from WebCT to Blackboard in 2007. This illustrated, however, the years-long experience that the Blackboard users had, though it was limited to Blackboard and WebCT. Just as Blackboard users had a strong history with WebCT, Moodle users had used BSCW relatively often. Compared to Blackboard users, Moodle users had previous experience on both Blackboard and Moodle. As some departments provided own Moodle installations at that time, the Moodle experiences could be from University of Helsinki, or from other universities. Blackboard was not provided elsewhere at University of Helsinki, and no Blackboard users mentioned experiences on Blackboard outside the University of Helsinki. The reasons that some teachers stayed with Blackboard and some, after using WebCT, Blackboard, and other systems, were finally using Moodle, could not be discovered based on the surveys.

Based on their previous experience on learning environments, the respondents were divided into a majority, illustrating mainstream users, with previous experience in at most two environments, and a minority, illustrating advanced users with experience in at least three previous environments, as summarized in Table 8.3.

Table 8.3. Division of respondents based on their previous experience on web-based learning environments to a majority and a minority with averages and maximum numbers of mentioned previous web-based learning environments (Survey 1).

Respondents having previous experience on	Blackboard users	Moodle users
	Percentage of respondents	
no more than two systems	94.5%	85.3%
at least three systems	5.5%	14.7%
	Number of systems	
Maximum number of systems per user	6	9

For respondents using Moodle, the proportion of advanced users was somewhat bigger than that of Blackboard users. Respondents using Blackboard had less comparative previous experience than respondents using Moodle. As a result, mainstream users' comparative knowledge about web-based learning environments was from, at most, two other systems, while knowledgeable users had experiences of at least three other systems.

8.1.2 Collected experience

To answer research question 1.2, Nielsen's (1993) User Cube dimension Experience was applied as Usage experience of the system in question, illustrated by number of course areas used in teaching. In the first survey, respondents were asked about their amounts of teaching using web-based learning environments by number of course areas in a multiple-choice question with choices of 0, 1, 2, 3, and 4 or more courses. The choice of 1–3 courses were combined as "some courses," and the category "4 or more courses" was listed as "many courses." The combined results are presented in Table 8.4.

Table 8.4. Number of course areas in parallel in 2008 (Survey 1).

	No courses	Some courses	Many courses
Moodle users	10%	75%	15%
Blackboard users	6%	75%	19%

Blackboard has been provided since 2000 and Moodle since 2007. The number of Blackboard and Moodle course areas used in teaching in 2008 were at the same level, as presented in Table 8.4. As the results illustrate, most teachers used a few course areas in their teaching. The proportions of teachers using multiple course areas in their teaching remained about the same in all the surveys. Based on the results, using a few course areas in teaching illustrates mainstream use. This represents the overall situation in university-level teaching: teaching personnel typically teach one or two courses per academic year. Additionally, course areas can be reused, which results in a few parallel course areas. Based on the responses on the numbers of course areas used in teaching, mainstream users receive at most moderate experience in using the system, while a minority of teachers receive more extensive experience.

8.1.3 System expertise

Respondents in Survey 1 were asked about the working methods and system properties they perceived they had experience in. For research question 1.3, Nielsen's (1993) User Cube dimension of System expertise was used to illustrate the number of properties reported as familiar. Therefore, to create a quantitative view of user experience, combinations of properties used were investigated. Respondents were grouped by the number of properties they were familiar with, as presented in Figure 8.2. Because of the check-box question type, respondents with no experience on any properties were considered the same as those who did not respond, i.e. missing information, and were left out of the figure.

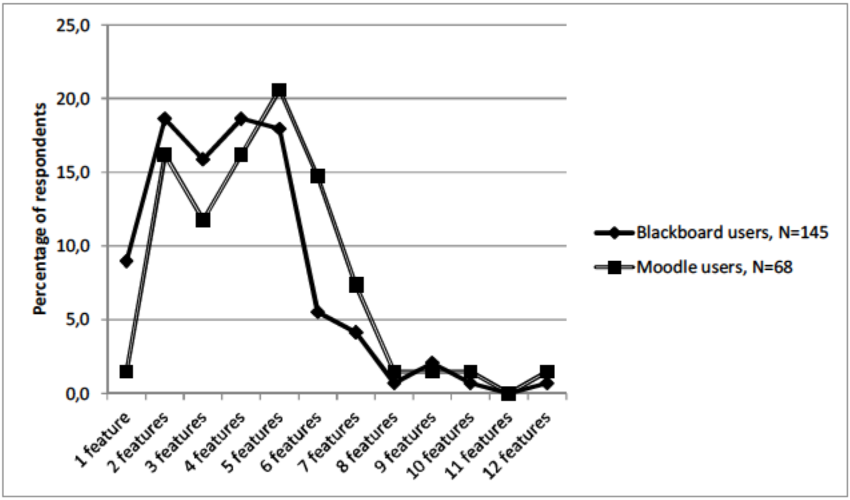

Figure 8.2. User experience on features grouped by number of features in Blackboard and Moodle (Survey 1).

Based on the reported experiences with environment properties, the majority of mainstream users, familiar with a small set of properties, represented novice and basic users of systems, and a minority of users used a variety of properties, approaching expert use of the system. Additionally, the results illustrated the largely similar in profile experience of Moodle users compared to Blackboard users.

8.1.4 Quantitative view of teachers as users of web-based learning environments

Research question 1 concerned the need for a quantitative view on teachers as users of web-based learning environments. Respondents using the web-based learning environments Blackboard and Moodle at the University of Helsinki were characterized in previous sections based on survey results using three dimensions of quantitative expertise. Corresponding to the three dimensions in the User Cube by Nielsen (1993, pp. 43-48), previous experience in web-based learning environments represented knowledge on computers and web-based systems in common, the number of course areas used represented teaching routine, and the system properties used represented knowledge of the system. Based on the results presented in the previous subsections 8.1.1 to 8.1.3, respondents were grouped into a majority and a minority in each dimension. The overall user profile was constructed based on the grouping principles, as summarized in Table 8.5.

Table 8.5. Grouping of teachers based on Jakob Nielsen's (1993) User Cube with proportions for each variable separately (Survey 1)

User Cube dimension	Illustrating characteristics	Position on the scale
	MAJORITY: "Mainstream"—all of these	
Previous experience	0–2 previous systems	Minimal or limited
Teaching routine	1–3 course areas	Little or casual
System knowledge	1–6 properties	Novice or basic
	MINORITIES: "Advanced"—at least one of these	
Previous experience	3+ previous systems	Extensive
Teaching routine	4+ course areas	Strong
System knowledge	6+ properties	Expert

Majorities of each dimension were combined to comprise an overall majority category called "mainstream users." The combined dimensions of individual majorities represent the most typical user category in using web-based learning environments at the University of Helsinki. *Mainstream users* had used at most one or two web-based environments in teaching, having at most a few course areas every year with a limited number of features. The number of active course areas stayed low year after year because of the typical yearly teaching load at the university of one or two courses. This decreases the possibility to gain, maintain, and enrich expertise on web-based learning environments and the properties they provide in use, so the mainstream user is a casual user of web-based learning environments.

In addition to the mainstream users, there were minorities that can be called advanced but with different balances of experiences compared to each other. Still, they had partly overlapping properties because their expertise built up from one or more of the three dimensions: previous experience, routine, or versatile properties. The proportions of mainstream and advanced users are presented in Table 8.6, showing that the basic types are equal for both systems.

Table 8.6. Percentages of mainstream and advanced users (Survey 1).

	Mainstream	Advanced users
Moodle users	72%	28%
Blackboard users	70%	30%

Compared to the original three named dimensions in Nielsen's User Cube, the sub-dimensions each combining two of the dimensions also needed to be named to illustrate teacher expertise in more detail. Therefore, altogether, eight categories of expertise were obtained, presented in Table 8.7.

Table 8.7. Categories of expertise named by the author, applied based on Nielsen (1993), where + indicates advanced expertise.

Expertise category	Type of expertise		
	Previous experience	System knowledge	Teaching routine
Mainstream user	-	-	-
Aware newbie	+	-	-
Tester	-	+	-
Repeater	-	-	+
Aware repeater	+	-	+
Strong system expert	-	+	+
Aware tester	+	+	-
All-round experienced	+	+	+

Teachers with background knowledge but no routine with the system yet are called *aware newbies*; they were new users of the system but knew what they wanted because of strong skills in corresponding systems. Teachers with strong system expertise without routine or background knowledge are called *testers*; they have just started using web-based learning environments but they have the curiosity to learn the system well from the beginning. Teachers with only a teaching routine without background knowledge and system expertise are called *repeaters*; they use the same simple properties year after year without developing their teaching.

Expert users with a great deal of teaching experience from other similar systems but who always use the systems with only basic properties are called *aware repeaters*: they repeat their simple teaching methods in their teaching routine. Teachers with a teaching routine and system expertise are called *strong system experts*. They vary their teaching methods with various implementations. Teachers with knowledge on corresponding systems and system expertise but no teaching routine are called *aware testers*; they might be support personnel or new teachers. Finally, *all-round experienced* teachers have experience in all three types.

To illustrate how the experience of advanced Blackboard and Moodle teachers was divided, profiles are presented inFigure 8.3.

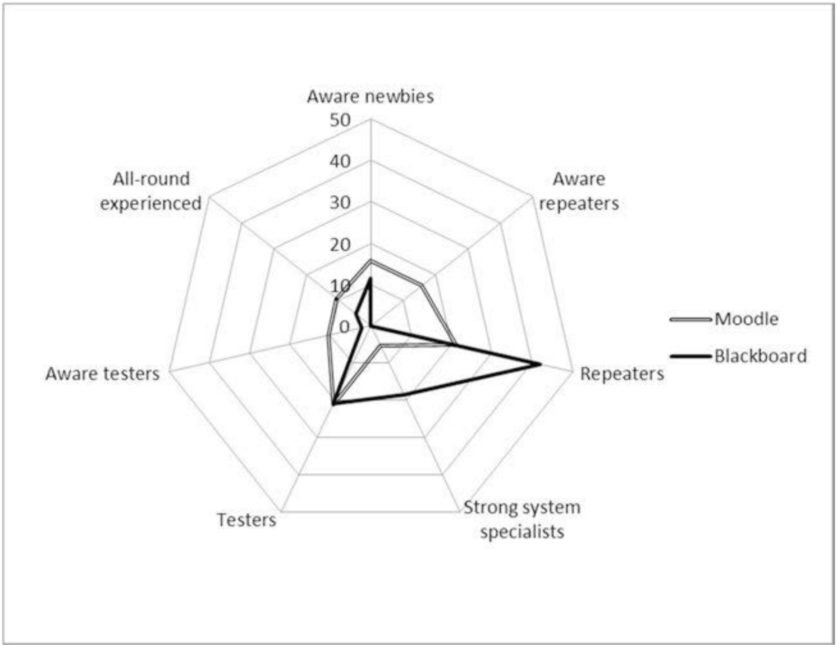

Figure 8.3. Advanced Moodle and Blackboard user profiles in percentages of respondents categorized as advanced, Survey 1.

The expertise of advanced Moodle users was distributed among the dimensions quite evenly, indicating that Moodle had attracted different types of teachers: teachers with context knowledge on web-based learning environments who had wanted to change to Moodle and teachers new in using web-based methods. The only expertise dimension represented less than the others was the strong system specialists. This illustrates the newness of the Moodle installation at the University of Helsinki at the time of the survey in 2008. Because of the lacking system expertise, the number of all-around experts was small.

Advanced Blackboard users, who were greater in number than advanced Moodle users but equal in proportion, presented a different expertise profile than Moodle users did. Blackboard users showed strong system expertise, but their profile was in unbalance towards repeating. Because of the lack of comparative context knowledge on other web-based learning environments, Blackboard teachers' expertise profile was also missing aware testers and aware repeaters. Overall, experienced Blackboard teachers had strong teaching routines with the system they had been using with the same few methods they had been using before.

The Moodle and Blackboard teacher expertise profiles illustrated users in two phases of using a system: Moodle users with strong background knowledge had recently started using a new system, while Blackboard teachers had used Blackboard for a long time during which they had gained strong routine. Though Blackboard users had had more time to use Blackboard than Moodle users had to use the piloted version of Moodle at the time of the survey in 2008, their expertise had evolved more to uni-dimensional repetition of same methods than to multi-dimensional system expertise. Moodle users' profile instead illustrated more various combinations of expertise.

To learn further about the all-around experienced teacher expertise in using web-based learning environments, the results for research question 2 will be presented below.

8.2 Experienced user focus on using technology in teaching

This section presents results that answer research question 2. To illustrate, for research question 2.1, what experienced users' expertise consists of and what they focus on in teaching using web-based learning environments, the interviewees were categorized based on their expressed pedagogical and technological thinking into three groups on each dimension. The dimensions were combined as a 3x3 matrix of categories that illustrates how the focus is targeted in using technology in teaching. Further, features that illustrate differences between the categories of focus are presented to answer research question 2.2.

8.2.1 Pedagogical and technological focuses combined

For the categories on the pedagogical dimension, Biggs' (2003) theory on three levels of teacher thinking about teaching (pp. 20-33), presented in Chapter 2, was used. The interviewees were placed at one of the three levels based on their focus in teaching. Interviewees who used expressions describing pedagogical misunderstanding and about what students are were placed at level 1. Interviewees who used teacher-centered expressions focusing on their own needs and comfort in teaching over student learning needs were placed at level 2. Interviewees who emphasized pedagogical goals even over the workload or complexity for teachers were placed at level 3.

For the categories on the technological perspective, a corresponding three-level scale was used. The theoretical background for the scale applied a combination of Nielsen's (1993, pp. 43-48) theory on users of systems and Rogers' (2003, pp. 279-299) theory on adopters of innovations. The scale was called "technological innovativeness" with the categories "minimal," "moderate," and "extensive." Users who expressed unawareness of technology or showed little technological interest were placed in the minimal category. Users who expressed being technologically curious and aware but lacked deep understanding were placed in the modest category. Users who expressed deep technological understanding and interest were placed in the extensive category.

To create a picture of what experienced users focus on in using technology in teaching the pedagogical and technological dimensions were combined as a 3x3 matrix. As a result, six categories of *focus in educational use of technology* were found. They are presented in Table 8.8, followed by descriptions with quotes. As shown in the table, the experienced user expertise is illustrated strongly in at least one of the dimensions.

Table 8.8. What experienced users focus on in using technology in teaching as identified in the interviews.

Focus in teaching	Technological innovativeness		
	Minimal	Moderate	Extensive
Level 3	Focus A: Pedagogy	Focus B: Pedagogical goals	Focus C: Educational development
Level 2	N/A	Focus D: Own learning	Focus E: Own easiness
Level 1	N/A	N/A	Focus F: Technological tricks

In the following, the categories are presented from A to F.

Experienced users in categories A-C with a *Level 3 focus on teaching* have solid pedagogical insight with a learning-centered approach to teaching (Biggs, 2003, p. 20-33; Biggs & Tang, 2007) and student-centered methods: they want students to learn and think about students' process.

> *"What I aim for… [with the web-based methods is] I think of how to best support the… process… […] sort of so that the [studying/learning] process does not get interrupted because there might be a long break between the contact lessons, so the existence of the platform kind of reminds them and maintains the process. So*

that's a quite important function, that you don't have to start over in every contact lesson but instead the process is there all the time […] with the discussions, information, and assignments" [Interviewee 3, human science]

The differences between categories A-C on pedagogical level 3 come from the approach to technology, which is also reflected in selected methods with students.

Users in the category A with *focus on pedagogy* have pedagogical awareness but lack technological interest and therefore innovativeness. They use centrally recommended and provided, user-friendly solutions such as BSCW and Moodle. Because they are technologically uninterested, it is important for them that the systems do not require technical skills.

"It's somehow so nice with Moodle when you don't have to be a technical miracle child; you don't even have to be interested in technology, and still it works and it's nice to use. That's a big bonus. […] It's very important." [Interviewee 3, human science]

Compared to the previous category with pure pedagogical interest, in the category B with *focus on pedagogical goals*, users have curiosity, providing them with motivation and interest to become familiar with and test alternatives among provided systems such as WebCT, Blackboard, and Moodle. Therefore, they are among the early adopters (Rogers, 2003, pp. 279-299) in educational technology with long-term experience and routine. Because their strong pedagogical content knowledge and understanding of benefits that educational technology can provide are combined with technological curiosity, they have been able to develop into good educators with motivated working and evaluation methods.

"I'm so curious that I want to know everything, and at some point in the beginning of the 2000s, I made the decision to learn everything that comes, and I took all the courses that were available. I had to try. […] And that is very good because then you learn and get a view." [Interviewee 9, human science]

Pedagogical goals are motivated and steer all use of technology. The understanding of added value in educational technology is also concretized to actions in course planning with awareness.

"I have had constructive alignment always in mind when I design courses, so first I think of the learning goals that students should reach when they have passed the course. Then I start to think what would be the best tools in Moodle. […] I start with what the student does and then, and assessment I actually think all the time there besides on how all things should be assessed." [Interviewee 8, human science]

Compared to the category C in level 3 with deeper technological understanding, users in the category B with *focus on educational goals* lack technological understanding and probably further interest, so they cannot demand properties for their needs but are satisfied with what is provided for them. With increased technological knowledge, they would be able to develop their teaching in a more radical way.

"That's the way it goes; I wonder if technology can be bent for this. […] it would definitely ease teacher work, but I understand that technology can't manage with all these nice-to-have things." [Interviewee 8, human science]

As for users in the category C with *focus on educational development*, compared to other users with a level 3 focus on teaching, users with extensive technological innovativeness combined with pedagogically sound goals are able to benefit from the opportunities that educationally modern, daring, and radical technological solutions provide. Users with a strong understanding of technology can therefore target and keep their focus on educational development with new technological applications. The provided solutions are applied when suitable for the needs but are not restricted to them.

"I have never thought that the system itself would be relevant, but instead, the system is selected based on the pedagogical thinking, and with pedagogical I think what is meant to happen, like in the educational settings, and is hoped to result in learning. And then the system like… naturally creates the support structures on the web. Sometimes BSCW was the right system [for the needs], and sometimes it was [another system]." [Interviewee 5, science]

They are familiar with a variety of technical solutions and are able to select those that best support the intended types of learning they want to provide their students with. Further, they are interested in developing their own solutions and combinations of solutions if the existing alternatives do not provide pedagogically strong enough benefits.

"Everybody can use some tools, and we use those tools that happen to be there, and next year, it might be all different. So it's like part of the profession that you use and create new tools all the time; when you hear a signal on a new tool, then you might test it, and the situation lives all the time. The tools themselves are secondary, but when you have the best course in the world, then you do it with the tools that suit it, that are at the moment the world's best tools for doing it." [Interviewee 5, science]

These teachers have strong practical skills in teaching and strong self-reflective skills. They are interested in developing their teaching, and they push themselves out of their comfort zones; they are always at their limits.

"I think I have once again stretched my technological knowledge to the limits I dare to in these courses. I'm moving on my limits, so we'll see. […] I'm excited because this is brand new." [Interviewee 1, science]

However, these teachers have greater personal capacity and capacity to cope with uncertainty to benefit from, as well. Because of the required skills, awareness, and resources provided by their communities, this group is very small.

Users in the category D with *focus on their own learning* are relatively new teachers who so far lack experience but have a positive attitude toward teaching and with a focus on and motivation for their own development, and they are eager to learn more and to apply the methods in their teaching.

> *"As long as you don't have any routines, so you are labile, it's easy to adapt [to a system], but immediately when you have ideas on how things should be done, it is difficult." [Interviewee 10, bio and life sciences]*

They see added value in using educational technology and have the innovativeness to see the technological opportunities. Their technological innovativeness supports them in their pedagogical development. On the other hand, they are tempted to think in a teacher-centered way. At the same time, they are pedagogically aware and want students to learn also assessment skills. However, as pedagogical and technological ideas are still in the planning stage, the overall phase of development places them at level 2 in pedagogical and technological focus.

> *"It provides opportunities, or gives ideas, for other types of working methods than talking like a parrot in front of an audience. For example, this PBL […], and above all, I'm interested in making them read each other's homework and peer-assess them [on a scale] whether it was enough or too little […]. So far, it has been on paper, but I could use Moodle in pairs so that they could switch essays. It would also reduce my workload if I could group them." [Interviewee 10, bio and life sciences]*

In the category E with *focus on own easiness* are the most contradictory users; those having knowledge on pedagogical and technological issues but are not fully using their knowledge for the benefit of their students. Compared to teachers in the previous category D with *focus on their own learning*, teachers in this category E are more skilled technologically, but they do not apply all their knowledge to student activity.

> *"In my own work with colleagues, I do use a wiki. But in teaching, no." [Interviewee 6, bio and life sciences]*

Compared to users with a level 3 focus on teaching, the use of technology in category E focuses on users' own teacher-centered processes. They use technology to manage learning better, typical of a level 2 teaching focus (Biggs, 2003, p. 20-33), and they are interested in using their technological skills to benefit these purposes. The value of educational technology is to make teaching and studying more effective and time-saving instead of providing added value to teaching or learning. It makes teacher processes easier, but students also benefit from increased flexibility.

> *"I attain to imitate face-to-face communication as well as possible with the web-based methods that I select, so I don't see… I don't use it for goals that could not essentially be reach with face-to-face working methods […but] I perceive it better*

with web-based methods because all students come from different campuses" [Interviewee 6, bio and life sciences]

The reason that these teachers in category E are not at level 3 is their need to reduce their cognitive loads and select methods that are easy for themselves instead of meaningful for students. The needs to reduce cognitive load are twofold in teaching designs. Some teachers want to control student work and as a result use lower-level technology than what would be pedagogically more suitable but too free of control from the teacher's perspective:

"I've even said that don't move [your discussion from the discussion area] to e-mail [because] then I totally drop off" [Interviewee 6, bio and life sciences]

Other teachers do not care to control but instead trust students, who are allowed to use any systems they want, without interfering in their part. If the teacher is able to trust students in selecting most meaningful methods and students indeed are able to do that, the resulting methods can be better than the teacher's teaching approach actually would require, though trust would not result from the student-centered approach.

"They [the students] have used that discussion forum in Moodle for communication, or a wiki, but I haven't interfered with that; I've just said use it if you want to." [Interviewee 11, science]

Thinking like teachers in category E reduces the student-centered focus in teaching. This, in turn, reveals the student-centered opportunities in using educational technology.

Users in the category F with *focus on technological tricks* are the most technologically innovative, and technology is leading all decisions made concerning teaching practices. Compared to users with a focus on higher pedagogical levels and extensive technological innovativeness, the strong technological knowledge is used for pedagogically less meaningful purposes. Educational technology is seen as an automated teacher substitute; as automatically pedagogical.

"If you consider student activation and active information processing and the fact that the system would adapt to student characteristics, e.g., by providing more challenging assignments for students who know more, then the tools Moodle provides… you can't do e-teaching properly with it. You can distribute material and people chatter there [about] this and that, but that won't guarantee anything. But should e-teaching be scalable in a way that the teacher won't have to provide everything for everyone, then you need advanced tools so that, when the structure is ready, then you just let go! Students work by themselves, and I can do something else!" [Interviewee 7, bio and life sciences]

These teachers in category F are reflective in their actions, but because of their level 1 focus on teaching, they misunderstand the reasons for their reflection results. In spite of their good means, they end up performing teacher-centered actions. They try to force students to do something they otherwise would not do by using technical tricks and restrictions, e.g. proceeding in certain sequences while trying to prevent all other alternatives.

> *"I constantly have the feeling that students don't get deep into these environments on the way but instead only look for the passwords for the final test that must be put behind a password because students originally took the final test without the reading material. [… Now] I'm going to avoid the mistake by providing [… the material] with constant questions and loops that you cannot proceed through while missing basic skills, so then they just loop there until…" [Interviewee 7, bio and life sciences]*

By proceeding through the chain of contents, students are expected to learn more. These teachers try to find a technical shortcut to pedagogical success. Students are not believed and trusted, which causes the need for strict steering of their workflows.

> *"When you see that there is a problem situation, you change the structure so that the problem would be eliminated […], but sometimes, it's so hard to find good solutions for the problematic situation that you instead have to delete the feature you would have liked to use. […] So you have to compromise because of complaints on daily basis. I'm quite skeptical of only adding information for the situation…" [Interviewee 7, bio and life sciences]*

Technological solutions are of high interest because of their features to substitute for the teacher and, as such, be seen as a shortcut to reach pedagogical goals. Therefore, technical and even complex solutions are desperately searched for. The pedagogical design of technological solutions aims at preventing the possibility of getting lost instead of providing learning opportunities. However, since these pedagogical goals are not fit, no solutions can be suitable.

> *"The system does not include features for preventing found defects. […] Or of course, there is a solution, but it's difficult to find idiot-proof solutions when the idiots are so inventive!" [Interviewee 7, bio and life sciences]*

The rest of the categories in the matrix, marked N/A, were not identified by the interviewees. Users within these categories of focus would have lower awareness on the pedagogical as well as the technological dimension of teaching with technology. If they use educational technology, it mainly includes sharing material and instruction and possibly receiving student submissions. Peers, as described by the interviewees, could, with moderate technological innovativeness, use blogs instead of web pages to distribute material because they are easier to update than web pages:

> *"Blogs are quite popular because quite many teachers just distribute material and inform students on practical issues. [… They are] easy to update." [Interviewee 8, human science]*

This type of technological innovativeness increases student access to provided material, and if the other alternative is that no material would be provided at all, this of course increases consideration for students and thus pedagogical development. Systems that are easy to learn are therefore important to provide because part of the aim of developing the use of educational technology is to encourage teachers to use it.

8.2.2 Factors that differ between the identified categories of focus

For the research question 2.2, three factors were identified that illustrate the differences between categories of focus on teaching with technology:

- Used peer work methods for students
- Transparency of the learning process and how it is made
- Collaboration partners

According to the socio-constructivist learning approach, learners learn in collaboration (Nevgi & Lindblom-Ylänne, 2009b), and further, the collaboration can focus on interaction, as in the dialogical learning approach, or on collaborative creation, as in the trialogial learning approach (Paavola & Hakkarainen, 2005). Through using only individual working methods, teachers support monological learning. In the interview results, there were different approaches to peer work methods, illustrating different levels of focuses on teaching and learning. The use of peer work methods developed with the pedagogical and technological focus level. An overview of the situation is illustrated in Figure 8.4.

Users in categories A, B and D with minimal or moderate technological innovativeness emphasized individual peer processes between course participants, such as discussion and peer commenting, supporting dialogical learning. Users in categories C and E with extensive innovativeness and at least a level 2 focus on teaching used, in addition to individual discussion and peer commenting processes, group processes such as group projects with common final products, supporting trialogical learning. Users in category F with a level 1 focus on teaching used individual working methods only with a focus on monological learning.

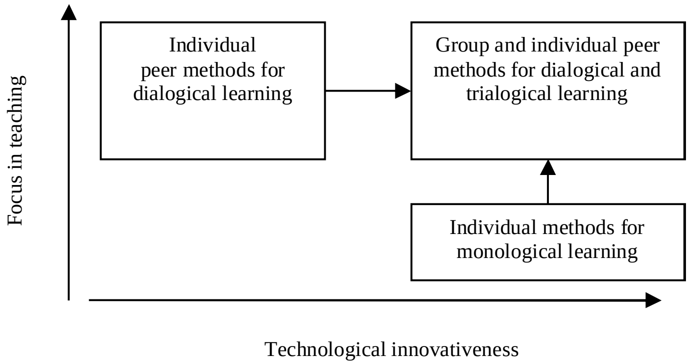

Figure 8.4. Differences in peer work methods between different focuses in using technology in education

With a level 3 teaching approach but with minimal and moderate technological focus in categories A and B, group work indicates peer support for individual processes, such as discussion or reading and commenting on peers' essays.

> *"They, for example, import assignments in text form there, and then they comment on each other's assignments." [Interviewee 3, human science]*

With a level 3 teaching approach and an extensive technological focus in category C, the socio-constructive learning approach is visible in the teaching designs as the learning-focused, student-centered, collaborative creation of knowledge.

> *"A good example is [the system] that gave the idea for building a collaborative course 'tree' and provided the follow-up methods for the building process so that people would not individually make their parts but instead the product was built under the very eyes of the whole course community." [Interviewee 5, science]*

In contrast, with a level 2 teaching approach in categories D and E, group work yields a collaborative product where all group members must take responsibility for the final product; i.e., the focus is on trialogical learning, but the technology used for the working method allows a focus on dialogical learning, such as using a discussion forum instead of a wiki, or the teacher allows students to use any technology without recommending any.

"Each group has two discussion forums. In one of them, they prepare the report, which is their group work." [Interviewee 6, bio and life sciences]

Users in category F with a focus on technological tricks seek individual learning and do not use peer work methods.

As a whole, pedagogical skills or technological skills along are not enough in providing versatile and pedagogically meaningful learning experiences; instead, providing trialogical learning with technology in teaching requires pedagogical and technological knowledge combined.

The learning process includes student work with submissions, after which the submissions are further processed by teachers, peers, or both, creating a cycle of work, submission, and assessment. The process can include one or multiple cycles with various individual and collaborative methods of work, submission, and assessment that can be private for the actors or public for others in the community to see. Based on the results, methods of making the process transparent were different between identified categories in teaching with technology. An overview of how process transparency is combined with categories is presented in Figure 8.5.

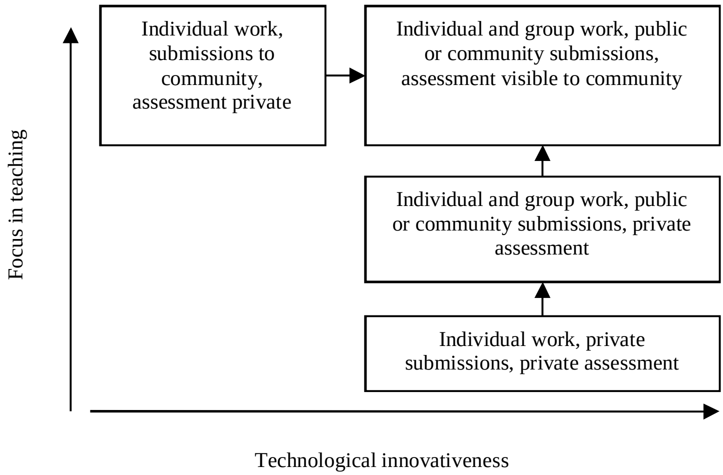

Figure 8.5. Differences in learning process transparency between different focuses on teaching with technology.

Users in categories A and B with less technological interest than pedagogical motivation, though level 3 in teaching focus, know that strong experiences create learning, but lack of courage restricts them from implementing the required, suitable technological methods in their teaching by publishing, in addition to submissions, assessment information for the community, supporting their students in further dialogical learning.

> *"It could be very educative for them, sort of. But I haven't… dared to… […] it would be a bit hard." [Interviewee 3, human science]*

Users in category C with extensive technological innovativeness and a level 3 focus on teaching use open and collaborative web-based methods and take the full benefit from the value provided by technology to teaching and learning. This factor makes this category different from all the others; users with a focus in this category are the only ones brave enough to demand from their students and put them in strong learning situations. These teachers know that strong situations create the best learning. Just as they push themselves, they dare to put their students into demanding situations as well, outside of their comfort zones, which supports the knowledge-building process in trialogical learning (Paavola & Hakkarainen, 2005).

> *"I believe that collaborative, even unpleasant experiences, just like the army for men, become a kind of survival story after months and years. One student recently commended the course wondering how it even had been possible […] and emphasized the importance of peer support in collaborative complaining about the enormous workload. I thought, 'Oh yes! It's been for your good only!' […] It's the joy of surviving; no matter where you have been in unpleasant circumstances […], when you survive it, then…! […] I think that it's the [conquering oneself …] It feels like the comfort zone becoming wider and wider." [Interviewee 1, science]*

This is something that is missing in the previously presented categories A and B. These users published their comments and evaluations for the whole community, noticing that it benefited students' learning.

> *"When the evaluations were openly there, folks started like using them as the starting point number 1 for self-directed learning" [Interviewee 5, science]*

Compared to the previous category C, users in categories D and E with a level 2 focus on teaching use group work methods, as presented previously, and technology is used for assessment as well, to ease the teacher's part of the process. Again, as a result, students benefit from the process as well.

> *"It's even easier to give feedback via e-mail because I can make a kind of… template […] with all the fields I want to. […] it's so easy to fill in the fields I want to, subject fields and others. And then when they have sent me the assignment by e-mail, I just reply all so the whole group receives the feedback, or I trust that the group member that has submitted the assignment to me forwards the feedback. I don't stress it more than that." [Interviewee 11, science]*

Just as users in category F with a level 1 focus on teaching see assessment as counting facts, technology is also used for this purpose. Students who work individually also submit individual assignments where goals and facts are quantified.

“I believe that no lecture or group teaching situation is very inspiring because there they just sit, but [with my method], they have to process. They process in the way that they, for example, get one question after another; of course, they have to go to the information source to find the answer, and then they submit the answer and receive feedback. If this goes well, then they proceed to more difficult tasks which may support maintaining interest.” [Interviewee 7, bio and life sciences]

The pedagogical idea of students processing information is somewhat misunderstood when students, instead of writing their own stories, are set to receive information and use ready-processed information; reading requires lower-level cognitive skills than writing. Overall, the factor of transparency of the learning process also illustrates how selected methods support monological learning.

To promote collaborative learning with a dialogical and especially a trialogical focus, the learning process should be transparent to the community so that students learn with and from each other during the work and assessment phases. To be transparent, the phases must be published—to individuals, groups, or the community. Even publishing openly on the web is possible with the suitable technology. This includes testing new teaching methods with technology in teaching and exceeding their own and students’ comfort zones, which requires the capacity to cope with uncertainty, a property of innovators as adopters (Rogers, 2003, pp. 279-299) and a relevant factor in trialogical learning (Paavola & Hakkarainen, 2005). Daring to make the different phases of the learning process transparent in the community also requires courage from the teacher. Overall, the support that students need for trialogical learning throughout the learning process is implemented by transparency in the learning assignments and their submissions as well as in the assessment phase by users whose level 3 focus on teaching is combined with extensive technological innovativeness.

Finally, a factor that illustrates different collaboration methods in teacher communities and deepens the knowledge about identified categories of teaching with technology: the methods and partners of collaboration. An overview of collaboration methods is presented in Figure 8.6. Based on the results, there were different directions of collaboration: assistants, peers, and experts. Additionally, the motivations for the needs of collaboration were consultancy, brainstorming, and tutoring, whereas the quality of collaboration included aspects of “I need” and “I give.” Most active collaborators were users who focus on their development otherwise as well. They learn from their peers and are able to apply the news in their teaching through radical changes in their course setup. Pedagogical experts, in turn, collaborate concerning their teaching with planning officers, who assist them in creating the course areas, and technological experimenters do not collaborate at all.

The amounts and methods of collaboration reveal one reason why the user categories that are located in the opposite corners of the model are in the corners: their lacking culture of collaboration. Below, the collaboration methods are presented in more detail.

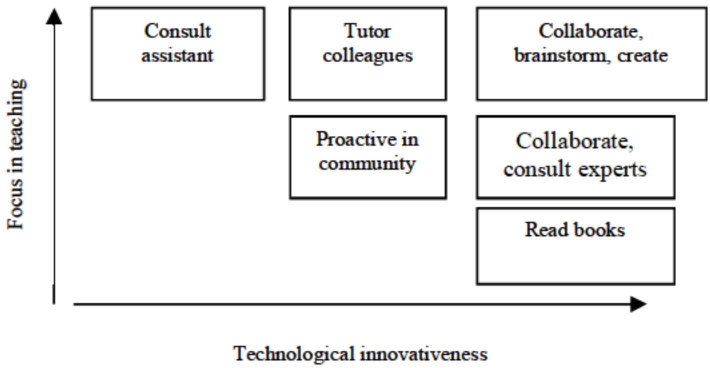

Figure 8.6. Types of collaboration grouped by focus on teaching using technology.

When the focus on technology is minimal in category A, the technological part is easily outsourced. Then, the collaboration direction in educational technology is to those who actually create the course areas.

> *"I haven't created them that much. I've always had assistance in it. [...] Usually, I sketch it on a paper [...] and then we have people in the office who create it." [Interviewee 3, human science]*

Compared to the previous category A, users in category B who actively focus on educational goals in teaching using technology have collected knowledge on best educational practices in using various technologies. Therefore they are seniors in educational technology in their communities and appreciated as tutors to their peers.

> *"I've somewhat given collegial support [...] because I know quite well what others do." [Interviewee 9, human science]*

Users in category C who focus on educational development collaborate with awareness with their peers and develop their teaching in collaboration, through brainstorming. They listen to each other and learn from each other. In addition, the university pedagogy is applied.

”I have good teacher colleagues who have participated in the university pedagogy [personnel training] and who provide me with good hints. They said that ‘we’ve just been there’ […] and ‘in the university pedagogy, this and this was always emphasized,’ so I said, ‘Ok, let’s see how we could get this fitted in here’ […] so [the pedagogical ideas] have been benefited from […] as they kind of did in their own teaching as well. […] And then, in unclear situations, they asked me about technical stuff ... or asked about hints on how I’ve been doing.” [Interviewee 1, science]

They collaborate and reflect with their peers on pedagogical issues, also as a systematic method of educational development.

“I’ve noticed that, if teachers have the attitude that, ‘hey I’d like to do cool stuff,’ but want support, in particular courage, kind of boosting, then this team teaching approach […] is needed in the development of material, course structure, assignments, assessment or something, in advance in collaboration […] in irc or [face-to-face]” [Interviewee 5, science]

Users in category D who focus on their own learning focus as well on pedagogical development. They are not senior to their peers in using technology in education, but they activate their peers and the community to learn more.

“I try to activate a kind of teaching forum here [in my subject], so we would meet every second week, and we could discuss all small and larger educational matters, and it’s in fact quite good. […] It’s quite uncertain still […], though it’s been perceived as useful. So we have thought to discuss, e.g., issues concerning [bachelor’s thesis] mentoring.” [Interviewee 10, bio and life science]

Users in category E who focus on their own ease in teaching know whom to collaborate with to get the best results, those they know who know more, and thus obtain a shortcut to best practices. These collaboration partners can be change agents in the community, e.g. e-learning support persons.

“I think I asked [the local e-learning support person] about basics; I like to learn so that I first get a small introduction, an hour or something, and then I click and test everything possible, and then I ask again for precise additional questions.” [Interviewee 6, bio and life science]

In addition, peer collaboration is used.

“Well, we in fact developed them together with [another teacher at the department]!” [Interviewee 11, science]

Collaboration increases quality assurance and gives fresh ideas for teaching, for example via unofficial coffee break discussions that may increase teacher awareness.

“It’s in the coffee room where we discuss [the tools used by others]!” [Interviewee 11, science]

Users in category F who focus on technological tricks prefer reading to collaboration; they learn from books and other mass media.

> *"I have to say I've become quite inspired from reading books. […] There was a book on Moodle, […] including very funny ideas. […] So I vote for books, definitely." [Interviewee 7, bio and life sciences]*

Overall, the increased level of pedagogical and technological focus on teaching with technology illustrated increased sophistication and complexity in collaboration methods.

8.2.3 Qualitative view on experienced user focus on using technology in teaching

Based on the results for research question 2 presented in this section, the identified categories of focus on using technology in teaching can be summarized with their main characteristics as follows:

A. **Focus on pedagogy:** users who are unaware of technology and have little technological interest. Technology is used for its known added value with technologically simple methods that support monological and dialogical learning. Lack of courage and technological interest limits further educational development. As adopters, they are among the majority.
B. **Focus on pedagogical goals:** users who are aware on technology and tailor it to suit their goals that support dialogical learning. Technological curiosity has brought them this far, but lack of technological interest keeps them from developing further. As adopters of technology, they are among early majority.
C. **Focus on educational development:** users who understand technology and have a strong emphasis on learning goals that support dialogical and trialogical learning. They are pushing their limits. Pedagogical development means radical design and methods that require courage. Pedagogical and technological understanding are strong and in balance. As adopters of technology in teaching, they are among early adopters, even innovators.
D. **Focus on their own learning:** pedagogical and technological novices who know they must develop and are interested in their own development. Pedagogical and technological understanding are under development in balance. As adopters of educational technology, they are among the majority now but may develop into earlier adopters.

E. **Focus on their own ease:** Pedagogical knowledge is contradictory to actions because technological knowledge and innovativeness are used in teaching mostly for teachers themselves. As a side product, students may benefit from the methods. As adopters of technology, they are among the early adopters; as adopters of technology in teaching, they are among the majority.

F. **Focus on technological tricks:** Users who try to compensate for pedagogical misunderstanding or low interest with technological solutions. Technology does not replace unfit pedagogical knowledge and purposes. As adopters of educational technology, they are among the early adopters or even the innovators.

8.3 Utilization of technology in teaching

The results in this chapter illustrate how teachers use technology and what they perceive as essential in their teaching as answers to research question 3. The results in this section are based on questionnaire and interview data with the number of respondents as presented in Table 8.9.

Table 8.9. Number of respondents in the results presented in this section.

	Blackboard users	Moodle users
Survey 1	145	68
Survey 2	181	
Interviews	11	

8.3.1 Features that teachers utilize when teaching with technology

Respondents in Survey 1 were asked about working methods and system properties they perceived they had experience in. The property names used in the questionnaires were tailored to be suitable for Moodle as well as Blackboard. Therefore, general methods, such as distributing material, were asked for instead of listing names of specific activities that could be used for certain purposes.

An overview of the properties used is illustrated in Figure 8.7. The most familiar features in both systems were distributing material via files and links, publishing assignments, and discussions via forums. The one visible difference between Blackboard and Moodle users' experience in system features was the increased use of discussion forums in Moodle. Features such as providing exams, automatic assessment, or synchronized discussion via chats were only little used.

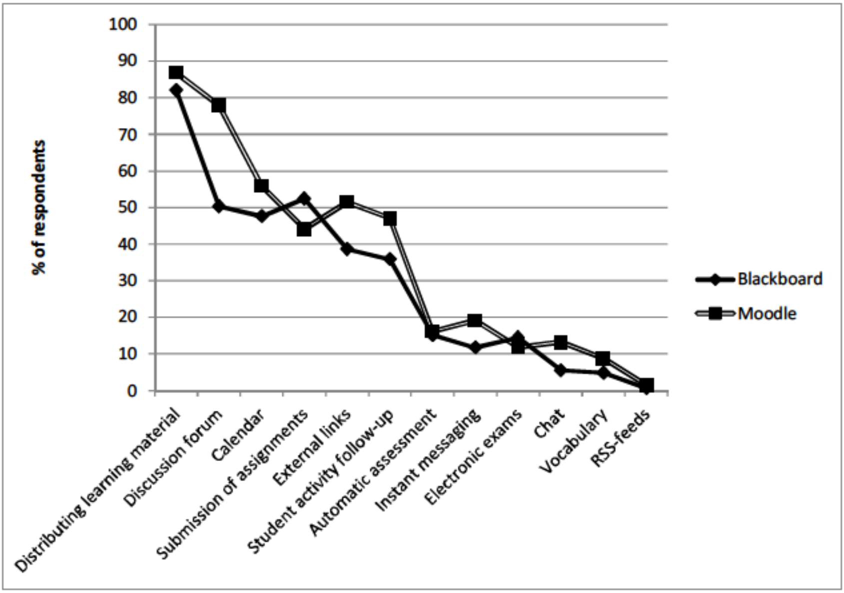

Figure 8.7. Percentages of teachers familiar with listed features in teaching (Survey 1).

Based on the familiarity of the features used, the features can be grouped into three categories:

- Primarily utilized features
- Assisting features
- Features for special needs

The primarily used features included the possibility to distribute learning material from teachers to students, indicating that the web-based learning environment was used merely as a distribution channel. In Moodle, discussion was also primarily used, allowing community-wide interaction, while in Blackboard, it was more of an assisting feature. Other assisting features included submission of individual assignments and features needed by the teachers, such as student activity follow-up and distribution of external links. The only feature possibly allowing community-wide awareness increase was the calendar, and it was not necessarily used in a collaborative way. Special features that were little used in Blackboard and Moodle included a) interaction and collaborative features such as instant messaging, chat, RSS feeds, and vocabulary and b) complex properties for exams and automatic assessment.

When comparing the contents of the grouping levels to theoretical benefits that technology could provide for learning, as presented in chapter 3, the primarily used and assisting features provide possibilities for monological and partly dialogical learning (Paavola & Hakkarainen, 2005), illustrating WeNetti's[44] steps 1–3. Additionally, the features are easy for the teacher to use from the usability perspective. Features that could provide opportunities for trialogical learning (Paavola & Hakkarainen, 2005), such as vocabulary, were little used, illustrating special needs.

Of note is that most of the features in Moodle and Blackboard provide support for monological or dialogical learning approaches, but few features support collaborative creation according to the trialogical learning approach (Paavola & Hakkarainen, 2005).

Compared to the above grouping, the included features can also be seen as basic level features, used when starting the use of technology in teaching, and advanced level features, used later on. Teachers may start with basic features, and when they gain experience, they may explore more complex designs from pedagogical, collaboration, or technically complex perspectives.

8.3.2 Features perceived as essential in teaching with technology

To find results for research question 3.2, teachers using Blackboard were asked about the features and the characteristics they considered most essential in their teaching. The open-ended responses were categorized under themes, as presented in Table 8.10.

Table 8.10. Features perceived as essential in teaching (Survey 2).

Feature	Respondents
	160 Request rate
Distributing material (files, links) from teacher to students	62%
Publishing assignments and receiving and assessing student submissions	34%
Discussion	31%
Sharing information (course practical details, etc.) from teacher to students	23%
Providing exams, self-assessment possibilities, and learning modules for students	8%
Having editing possibilities for structuring the whole	11%
Student lists and follow-up	7%
Group properties, calendars, and peer work; sharing and commenting on produced contents	3%

[44] http://www.hyvan.helsinki.fi/wernetti/portaat.htm (19.8.2011)

Many of the mentioned perceived essentials in teaching concerned the distribution of material and sharing information from teacher(s) to students and possibility to assign, submit, receive, and assess student assignments, illustrating Biggs' (2003, pp. 20-33) levels 1–2 focus on teaching and the monological approach to learning by Paavola and Hakkarainen (2005). A third of respondents perceived a discussion opportunity online as essential, representing a dialogical learning approach, while only a few respondents emphasized the need for features supporting trialogical learning, though the open-ended question format would have supported the expression of open pedagogical needs.

The presented essentials were in line with results presented in the previous section concerning features that respondents were familiar with. Most essentials mentioned concerned basic features, grouped previously as primarily used and assisting features, while more advanced features were needed less frequently. Based on the explicitly expressed needs, it was not possible to evaluate what produced these popularity priorities. It could have been teachers' pedagogical thinking, their technical restraints, or suitability for the teaching that these teachers employed at the time of the survey. As presented earlier, there were teachers who mostly distributed material and teachers who used a variety of features, but there were also more varied teachers who distributed information as one basic method in teaching. Additionally, some of the respondents expressed the perception of the possibility to create pedagogically rich learning environments with basic technical features.

Teachers justified their responses with needs arising from their teaching practices. The web-based course area was considered essential for sharing information, receiving submissions, providing a platform for discussion and collaboration, and giving and receiving feedback. These needs represented individual and community needs in providing a common place for the community, as well as in satisfying individual the usability needs of simplicity and ease of use. In this respect, the motivations correspond to the need for a groupware system used in work communities. A working community needs a place for sharing material for common goals, a place to discuss and work collaboratively that is closed to outsiders and simple to use, offering the possibility to participate whenever and where ever suitable and needed. The requirement for closed working place reflects, in addition to information security, the need to feel like a community, belonging to a group. On the other hand, the explicit needs illustrate primarily monological and dialogical learning approaches.

The results concerning perceived essentials in teaching were further grouped by information on fields of science provided by campus information. The results are presented in Table 8.11.

Table 8.11. Core differences between fields of science in features perceived as essential in teaching (Survey 2).

Feature	Fields of science based on campus areas			
	Human	Natural	Bio and life sciences	
	City	Kumpula	Meilahti	Viikki
	Number of respondents			
	28	13	6	83
	Percentage of respondents			
Distribution of material (files, links) from teacher to students	25%	69%	50%	75%
Sharing information from teachers to students	4%	15%	17%	27%
Opportunities for discussion (discussion forum, chat)	57%	0%	17%	22%
Need for exams and opportunities for self-assessment	14%	8%	0%	8%
Need for assessment features	4%	23%	0%	5%

Teachers in human sciences at the city campus expressed different essentials in teaching compared to teachers on other campuses: while teachers in natural, bio and life sciences in Viikki were focused on material distribution from teachers to students and not interested in providing discussion opportunities, teachers at the city campus emphasized discussion in the course community, and the possibility to distribute material was correspondingly perceived as less essential. Bio and life science teachers in Meilahti were between the two extremes in perceiving the distribution of material via the web-based learning environment as essential. The most likely reason was the Digital Course Library (*Digitaalinen kurssikirjasto*, DIKK[45]) provided by the Terkko campus library on the Meilahti campus; teachers publish their course material there instead of in the web-based learning environment. The results suggest that, based on the differences concerning essentials in teaching, there are differences in teaching approaches between fields of study, as reported as in a previous study (Postareff et al., 2009) from the University of Helsinki: teachers at the city campus in human sciences seem to be more learning-oriented, with an emphasis on a dialogical learning approach than teachers in hard sciences on other campuses, who seem to be more content-oriented in their teaching and support a monological learning approach (Paavola & Hakkarainen, 2005).

[45] http://www.terkko.helsinki.fi/dikk/ (8.3.2014)

8.3.3 How experienced users utilize systems in teaching with technology

How experienced users focus on using technology in teaching was illustrated in section 8.2. Each category of focus provided a perspective on the goals for which the selected features were used. This section provides additional information on how and which systems and features were selected as results for research question 3.3. An overview of the results is illustrated in Figure 8.8.

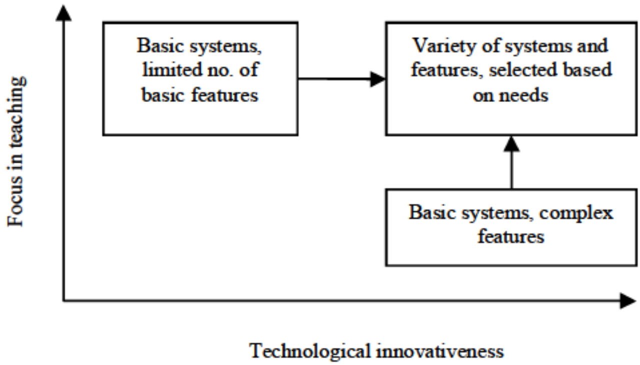

Figure 8.8. Utilization of systems between different focuses on teaching using technology.

The systems and methods selected by users in categories A to C with a level 3 focus on teaching illustrate their level of innovativeness. Users in category A with *minimal technological innovativeness* appreciate web-based systems that are technologically intuitive and straight-forward. They select the systems they use based on organizational recommendations and prefer the systems they have learned to use. Features included in centrally provided web-based learning environments such as Moodle work well for these teachers. More complex systems such as wikis are perceived as too complex in teaching.

> *"It feels like obvious that I use Moodle, it's hard to imagine having a course without it [...] It's so terribly nice with Moodle, when you don't have to be a technological miracle child, you don't even have to be interested in technology, and still it works and it's nice to use. So that's a plus.[...] Both from student and from teacher perspective [...] clearly better than wiki" [Interviewee x, human science]*

In addition, users in category B with *moderate technological innovativeness* use technologically simple methods but do so wisely to support the targeted pedagogical purpose and motivations. The importance of discussion forums is emphasized.

> *"Everything else can be replaced, but the most important thing is the discussion that cannot be replaced with anything; it's important that it works well, that it's easy for students to discuss, and it must provide a clear picture as well." [Interviewee 9, human science]*

Their pedagogical methods include teaching their students to utilize their methods with awareness systematically, and these systematic methods support the teacher's role, as well.

> *"They use this all the time. First, I give the homework here [in the news forum], from which they are sent to e-mail. [… New assignments] are published always in proportion, homework and assignments at the same time. It's always the last one, so they don't have to look for it there. [… They learn the system during the course], so that's why I think it's better to put them in proportion. […] It also makes [..] my life so much easier." [Interviewee 9, human science]*

Though the selected features are technologically simple, they are all designed and used to support student learning—the focus on learning goals is visible in teaching practices. Through curiosity and motivation to learn more about technology, it is possible to be aware of and find technological opportunities suitable for teaching. Few technological aids are used in assessment methods that are formative and qualitative. Pedagogical development involves tuning the course area based on reflection and student feedback.

> *"One concrete benefit is the building of course areas; when you recycle it, it evolves, and I'm really proud of what it's become! I just close my eyes… By the way, I have two course areas, and every time a course ends, I leave it open and reuse the older one. Just yesterday, I noticed that there had been a visit to the previous course area [ended one month before] one day before, so the visit was to use the links and material I have provided for them; it's a type of information repository for them after the course, and they might be interested in looking for this and that. […] That's when you can say you have actually achieved something, and that's why I have provided additional links and vocabularies and such." [Interviewee 9, human science]*

Overall, users with a pedagogical emphasis over technological innovativeness in the focus on teaching with technology select and are satisfied with the previously presented groups of primary and some assisting features in centrally provided systems. They use a restricted selection of features that support monological and dialogical learning (Paavola & Hakkarainen, 2005).

Users in category C focusing on educational goals and development in all their selections of systems and features choose the specific system and feature that supports defined learning goals.

> *"I've never thought that the tool would be crucial but that the tool is selected kind of based on the pedagogical thinking, and with pedagogical, I expressly think of what you want to happen there, like in teaching design, and that is hoped to lead to learning. […] It's kind of alive all the time, the field of tools, so the tools are secondary, and then, when you have like the best course in the world, then you implement it with the tools that kind of suit there, the ones that are the best tools in the world for implementing it." [Interviewee 5, science].*

These users are aware of features provided by the systems at the university, which are utilized when suitable, and external and new systems with specific features are used when they are needed. The selected features provide support for trialogical, dialogical, and monological learning (Paavola & Hakkarainen, 2005).

Users in category D with a focus on their own learning have a strong motivation for further development when they pilot for them new technology in teaching. There they benefit from the groups of primarily used and assisting features of web-based learning environments. They develop and learn by doing.

> *"Well, for example, one of my latest ideas was […] that if they've practically screwed up but still passed the course, they have the opportunity to raise the grade by writing an essay. And then the essay material is there [in Moodle], so from these subjects […], then they had the links or articles they would write the essay on." [Interviewee 10, bio and life sciences]*

Users in category D provide students with methods supporting monological and dialogical learning (Paavola & Hakkarainen, 2005).

Users in categories E and F who emphasize on technological issues more than pedagogical motivation select the technology they use in teaching based on their needs. Users in category E with a level 2 teaching approach therefore select technology that supports themselves in student follow-up and the management of learning. Therefore, teacher control of all student behavior results in restrictions on meaningful working methods with strict assessment and instructions. Then, the working methods are less meaningful than the teacher's teaching approach otherwise might result in.

> *"I've even said, or hoped, that the [group work writing] would not be moved [from the Moodle discussion forum] to e-mail so that I can be aware; I know that one year, one group wrote the group work by circulating an e-mail attachment, but then I totally dropped out because of course they wouldn't send it to me." [Interviewee 6, bio and life sciences]*

These teachers are skilled in using various software applications, like all users with extensive innovativeness, but the focus is on their own needs.

> *"I use Excel… [for student submission follow-up] because I'm so familiar with numbers." [Interviewee 6, bio and life sciences]*

These teachers have a strong routine with technology, and they are aware of why they do what they do. They select systems and features that support their work by making processes more effective with familiar systems, thus reducing their cognitive load, instead of learning a new way to do the same thing, in the best case slightly better but in the worst case with poorer properties. Typically, the features they need for their processes are missing from the centrally provided systems, of which the above is a good example. The combinations of selected systems and features support mainly monological and dialogical but sometimes also trialogical learning.

With a level 1 teaching approach in category F , the use of technology in teaching focuses on technological guidance and restrictions with complex features included in the feature group for special needs, supporting a monological learning approach.

> *"Then, when you see that there are problems [in student workflow], you start to change the architecture so that the problem will be eliminated. […] But sometimes, it's so hard to find a good solution to the problem, so you need to eliminate it […] but there weren't such features that you could have eliminated the defects [in student behavior]." [Interviewee 7, bio and life sciences]*

8.3.4 How technology is utilized in teaching

Distributing learning material was the primary use of technology in teaching by teachers in this study. The need to share practical details and material is obvious in all face-to-face courses and is conveniently implemented with web-based systems for teachers and students. The typical way of distributing lecture slides in digital format instead of copying them to students may also be considered an ecological issue, besides concerning the money and time required for manual copying. However, the proportion of teachers using technology merely for distribution of material was relatively high. Teacher comments on seeing the value of technology as distributing material in electronic form may be caused by a level 1 teaching approach of seeing teaching as distributing and learning as monological, individual thinking processes. Technical skills and awareness might not allow them to use more advanced educational technology. Additionally, teaching cultures in faculties guide teachers to select teaching methods that are familiar and similar to others nearby. This, further added to the pressure from students in requiring material via the web, may give teachers the impression that distributing material is enough. One questionnaire respondent even expressed it by saying, “*I don’t have time for pedagogical things*.”

The use of advanced features typically occurred after the basic features of distributing material and submitting individual assignments. The number of teachers with experience in most or all features provided in Blackboard or Moodle was small. This reflects the situation for any large computer program. The question is what and how large a selection of system features teachers should have expertise in (Nielsen, 1993) to provide quality teaching in basic cases.

Features perceived as essential in teaching were the same as those that users were familiar with, which implies that teachers use the systems with all their technological knowledge. The teacher needs were simple. Many pedagogically meaningful technical solutions do not require technically complicated structures, but, for example, including group work in the web-based methods used in a course would require, based on the results, pedagogical and technological skills along with courage. Teachers in human sciences expressed a more learning-centered approach than teachers in bio and natural sciences, who emphasized the distribution of material from teachers to students. These results were in line with previously conducted studies at the University of Helsinki (Postareff et al., 2009), suggesting that teachers in fields of human science typically are more learning-oriented in their teaching and that teachers in bio and natural sciences are more content-oriented in their teaching approach.

Experienced users who were technically aware and motivated as well as interested in developing their teaching could also choose a combination of external systems not specifically provided for educational use but responsive and suited to their needs. These teachers typically used new social media systems or virtual worlds as natural parts of their teaching. The centrally provided systems can never serve all versatile and ongoing needs. These experienced users do not even require centrally provided systems for them. The easy-to-use and simple overall systems that are provided as web-based learning environments are, based on the study, targeted to the mainstream users, whose goals include the most typical ones in teaching: to distribute material, share information, collect assignments, and assess them. The features needed for feedback and assessment, including teacher and student roles, alternatives for submission, feedback and grading features, statistics, and other follow-up and monitoring features are provided only in systems implemented for educational purposes. Mainstream users want to stay at least close to their comfort zones and are not interested in using time and effort spent on searching for, learning, and testing multiple systems. A drawback to that is that features supporting trialogical learning were mostly missing from the centrally provided web-based learning environments used in this study. Experienced users with a level 3 teaching approach have pedagogical goals so strong that they are willing to use the extra effort and courage to test new methods with their students. This includes technical and pedagogical courage.

8.4 User orientation to changes in technology used in teaching

Previous sections have presented university teachers as users of educational technology and methods of use. This section provides insight into teacher preferences when learning a new system as results for research question 4. To learn about teachers' orientation to a suggested change in technology used in teaching, adopter categories and methods preferred in the adoption process were investigated with the background of Rogers' (2003) theory on the diffusion of innovations (pp. 279-299). Methods were categorized and combined with adopter categories to present types of teacher orientation to change. The results in this section are based on questionnaire data with the number of respondents as presented in Table 8.12 below.

Table 8.12. Number of respondents in the results presented in this section.

Data collection method	Respondents
Survey 3	303
Interviews	11

8.4.1 Approaches to scheduling with adopter categorization

This section presents results for research question 4.1. From the teacher perspective, the change from Blackboard to Moodle, i.e., adopting the suggested change, could have occurred earlier or later during the long change period. In the autumn of 2009, one year after the phasing-out announcement, respondents were asked to estimate their personal schedule for the change process from Blackboard to Moodle. The summary of responses is listed in Table 8.13.

Table 8.13. Teachers' estimated change schedules (Survey 3). In the left-most column are the estimated start dates for the adoption process, while the rest of the columns present estimated dates when the process should be ready.

Start at earliest	Ready at latest							
	Ready	Jan 10	Feb 10	Apr 10	Jul 10	Aug 10	Oct 10	Dec 10
	Number of respondents							
Started	69	5	2	2	5	4	3	4
Dec 09		9	10	4	4	1	1	2
Jan 10			3	8	9	5	3	3
Mar 10				2	2	2	2	5
Jun 10					2	5	6	8
Aug 10						3	5	13
Sep 10					1		3	7
Nov 10								8

Based on the results, there were two main approaches in the scheduling of the change: teachers who had already migrated at the time of the survey and teachers who had not even started. Additionally, there was a third, minority group of teachers who had started the change but were not finished with it. Following the theory on innovation adopter categorizations by Rogers (2003, pp. 279-299) and its applications presented in Chapter 5, respondents were categorized based on their schedules in three categories and named correspondingly. Those who were already finished with the change process were separated from those who were not, and those who had not even started the process were separated from those who had. The overview of adopter categories is listed in Table 8.14.

Table 8.14. Adopter categories based on change schedule plans (Survey 3).

Change schedule	Adopter categories		
	Early adopters	Early majority	Late majority
Started	Yes	Yes	No
Ready	Yes	No	No
	Percentage of respondents		
	30%	11%	59%

The early majority was separated from the late majority in spite of the one-year changeover time; members of the early majority had implemented their adoption decision and thus were further along in the adoption process than members of the late majority. The late majority was not further separated into subgroups because their schedules were estimations: it was not possible to verify individual adoption decisions and schedules of their final changes.

Instead, it was expected that all respondents in the late majority group would change or at least give up using Blackboard within the given period.

Compared to the diffusion innovation theory, the possible laggard group of adopters as defined in the theory was not expected to be found because they would likely not be using educational technology. Additionally, the teacher profile in adoption scheduling did not create a clock curve but instead illustrated the “back of a two-humped camel” with two preferred strategies—as early as possible and as late as possible. Though university teachers would teach only on every second semester of the two possible, the original change window was designed wide enough with two whole years that the opportunity to make the selection of changing earlier or later existed.

The defined categories were further used in investigating possible differences in the preferred communication channels in adoption.

8.4.2 Communication channels in adoption

Research question 4.2 concerned communication channels used in the adoption process. Alternatives for the communication channels used in adopting and learning the new system were provided for respondents as answers to multiple-choice questions. First, the number of communication channels was investigated to identify differences in priorities. Then, the alternative channels in the adoption were combined with defined adopter categories to determine possible typical channels for the adopter categories and the differences among them. Finally, communication channels were combined with campus information to find out whether there would be differences between fields of study in adopting technology used in teaching.

Previously used communication channels were grouped by selected combinations of used communication channels, presented in Table 8.15. For example, if the respondent had participated in a course and contacted an e-learning support person, s/he used a combination of two channels. A 98% majority of the respondents reported to have used combinations of one to three channels.

Table 8.15. Combinations of communication channels already used in changing learning environments (Survey 3). The presented combinations of one to three channels represent a 98% majority of responses.

Communication channel	Combinations of communication channels used		
	One	Combination of two	Three
	Number of respondents		
	77	40	13

	Percentage of above responses		
Instructions on the web	5%	58%	46%
Course	36%	50%	69%
Technical assistance	1%	8%	15%
Local e-learning support	13%	23%	54%
Centralized e-learning support	1%	8%	69%
I managed on my own	27%	40%	15%
Something else	16%	15%	31%

The results suggest two main orientations: 1) the use of outside expertise via interpersonal channels, typically by participating in teacher training and 2) managing on their own. Instructions on the web were used as a secondary channel, along with the selected main channel. E-learning support was perceived only as a tertiary option.

When investigating the channels expected to be used in the future, the overall needs presented in Table 8.16 illustrate a similar but less clear split in orientation than in the previously used channels with instructions as a strong secondary method, but with a stronger emphasis on the use of interpersonal expertise via education and local support.

Table 8.16. Combinations of communication channels expected to be used in the change. The presented combinations of one to four channels represent a 96% majority of responses.

Communication channel	Combinations of communication channels to use			
	One	Two	Three	Four
	Number of respondents			
	103	54	37	14
	Percentage of above responses			
Instruction on the web	16%	72%	70%	79%
Course	15%	28%	54%	64%
Pedagogical course	1%	6%	19%	21%
Local e-learning support	19%	39%	57%	71%
Workshop	2%	6%	11%	21%
Advanced course	6%	11%	27%	50%
Technical assistance	2%	2%	11%	14%
Centralized e-learning support	3%	17%	43%	64%
I will manage on my own	25%	17%	5%	7%
Something else	12%	4%	3%	7%

Then, the previously used communication channels were grouped by adopter category, as presented in Table 8.17. As only early adopters and the early majority had started the adoption process at the time of the survey, the late majority is not present in these results.

Table 8.17. Communication channels used in the adoption, grouped by adopter category.

Channel	Adopter category	
	Early adopters	Early majority
	Number of respondents	
	63	23
	Percentage of respondents	
I managed on my own	48%	17%
Instructions on the web	35%	17%
Course	33%	65%
Local e-learning support	22%	26%
Centralized e-learning support	11%	22%
Technical assistance	5%	4%
Something else	14%	9%

Here, as well, there were two main types of prioritizing communication channels in the adoption, now visible by adopter category. Early adopters primarily managed on their own, while the group of early majority primarily relied on teacher training and other outside expertise. Besides these main differences, early adopters used instructions on the web more frequently than the early majority. Other interpersonal channels were used little by both user groups but more by the early majority. Accordingly, among the early majority, only a minority perceived to have managed on their own. The results follow the innovation diffusion theory on adopter categories (Rogers, 2003, pp. 279-299) for the typical communication channels; early adopters prefer to work independently and through cosmopolite mass media channels, while later adopters prefer more interpersonal and local channels.

When investigating the communication channels that would still be used in the change, the last identified adopter category, the late majority, is included. The results are presented in Table 8.18.

Table 8.18. Estimated communication channels grouped by adopter category.

Communication channel	Adopter category		
	Early adopter	Early majority	Late majority
	Number of respondents		
	66	22	128
	Percentage of respondents		
Instructions on the web	38%	36%	52%
Course	12%	9%	44%
Pedagogical course	5%	9%	9%
Local e-learning support	30%	36%	41%
Workshop	3%	0%	12%
Advanced course	18%	14%	16%
Technical assistance	3%	5%	7%

Centralized e-learning support	11%	32%	22%
I will manage on my own	30%	18%	11%
Something else	6%	14%	7%

Based on the results, early adopters expected to continue managing on their own, using instructions on the web and contacting the local e-learning support when needed, i.e., with an emphasis on channels with less interpersonal contact. The late majority expected to select an even stronger variety of interpersonal channels than the early majority used. Here, the lack of awareness of needs is most likely visible as uncertainty concerning what to do. Instead, the early majority started to resemble early adopters in their intentions concerning future communication channels but with more assistance and less interest in advanced courses. In this respect, the results would indicate that, when the knowledge of the future system increased through selected channels, the adoption process was nearing its finish.

When the two previous grouping principles were combined and adopter categories were grouped by number of communication channels used in parallel, as listed in Table 8.19, the results show that early adopters expected to manage with the least communication from the three adopter categories, and teachers in the late majority group perceived needing the largest variety of interpersonal communication.

Table 8.19. Adopter categories grouped by estimated communication channels in parallel (Survey 3).

Channels in parallel	Adopter category		
	Early adopters	Early majority	Late majority
	Number of respondents		
	66	22	128
	Percentage of respondents		
One	68%	55%	36%
Two	17%	18%	30%
Three	6%	27%	21%
Four	9%		6%
Five			3%
Six			3%

These results demonstrate typical adopter behavior in that later adopters are known to require more support, also requiring more calendar time, to adopt.

Communication channels were further combined with campus information. The results for previously used channels are presented in Table 8.20.

Table 8.20. Communication channels used in the adoption, grouped by campus information (Survey 3).

Communication channel	Campus area			
	City	Kumpula	Meilahti	Viikki
	Number of respondents			
	20	17	8	75
	Percentage of respondents			
I managed on my own	20%	65%	13%	24%
Instructions on the web	45%	29%	25%	23%
Course	65%	0%	63%	45%
Local e-learning support	20%	6%	25%	27%
Centralized e-learning support	20%	6%	25%	9%
Technical assistance	0%	6%	13%	7%
Something else	15%	12%	0%	23%

The communication channels used by teachers at the Meilahti, Viikki, and the city campus resembled each other in the sense that training was the most popular channel and local e-learning support was used as well. Kumpula teachers, in contrast, mostly managed on their own. Teachers at the city campus, i.e., representing human sciences, preferred teacher training, and teachers at Viikki relied on local e-learning support. Viikki teachers even motivated their selections for communication channels with collegial support and named people who would assist them in the change. This gives another perspective to teachers' channels: working culture and collegial support in the working community and local expertise at the campus support teachers in learning and duty management.

As the city campus represents soft sciences and Kumpula campus hard sciences, the results could also indicate that teachers in hard sciences prefer mass media channels and managing on their own while teachers in soft sciences prefer interpersonal channels.

The expected communication channels were finally compared with campus cultures. These results are presented in Table 8.21. Compared to the actual methods used, these profiles resemble each other more. Kumpula teachers still differ in their independence in communication and lack of interest in teacher training. Teachers in human sciences and at the Viikki campus wanted to continue to rely on interpersonal channels and outside expertise: instructions, teacher training, and local e-learning support. Teachers on these campuses commented on the possibility of asking for collegial advice, indicating cooperative working communities.

Table 8.21. Future expected communication channels in the adoption grouped by campus information.

Communication channel	Campus area			
	City	Kumpula	Meilahti	Viikki
	Number of respondents			
	39	28	10	120
	Percentage of respondents			
I will manage on my own	18%	36%	10%	12%
Instructions on the web	59%	46%	30%	44%
Course	41%	11%	40%	33%
Pedagogical course	10%	0%	10%	8%
Workshop	10%	4%	10%	8%
Advanced course	13%	11%	10%	19%
Local e-learning support	38%	21%	20%	44%
Centralized e-learning support	23%	21%	10%	19%
Technical assistance	8%	7%	20%	5%
Something else	5%	7%	10%	9%

Finally, to find out whether individual teachers planned to continue using the previously used channels or whether they would select others instead, the expected channels were compared with each of the three most typical, previously used channels: taking a basic course, representing the most typical interpersonal channel, using instructions on the web, representing the most typical mass media channel, and managing on their own. These grouped results are presented in Figure 8.9.

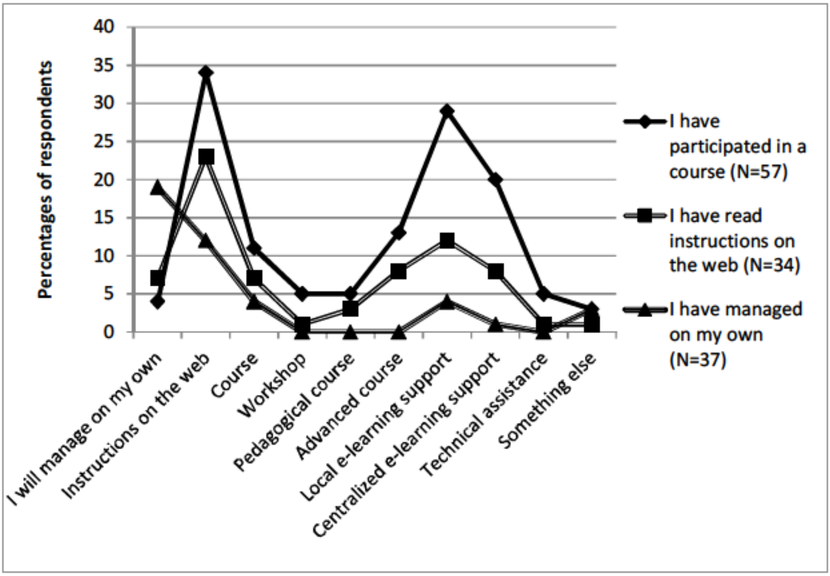

Figure 8.9. Future orientations in the adoption among teachers with a history of participating in a course, reading instructions, and managing on their own.

The three investigated types of teachers had clearly differing future channels from each other, which were consistent with what they already had used. Teachers who already had participated in a teacher training planned to continue with instructions and external support, i.e., emphasize interpersonal channels. Those teachers who had perceived to have managed on their own planned to continue independently in the future, with instructions on the web as the only external help. Additionally, the independent users showed interest in a lower total number of working methods than the other groups of teachers; the course participants intended to use the most versatile list of methods. Teachers who had already used web instructions were between the two other groups concerning their future plans, showing a similar method profile with the course participants but with lower interest in all the suggested methods. Both course participants and independent teachers expressed having used instructions on the web as a secondary method. Therefore, the third teacher type, those having used web materials, does not differ from the two other groups.

These results are based on responses received from teachers who already had used some type of method in implementing the requested change in learning environments, i.e., early adopters and the early majority, representing about one half of the number of respondents in the previous results in this chapter. Because corresponding information on history and future information on the majority was unreachable, no further conclusions on the working habits of the majority group of teachers could be drawn. Based on the results, the respondents knew what types of working methods they preferred, as they wanted to continue using them.

Overall, there were two main types of strategies concerning the communication channels to use in adopting technology in teaching: managing on their own with instructions on the web, preferred by earlier adopters and teachers in hard sciences, and systematic use of external expertise via interpersonal channels on courses and via e-learning support, prioritized by later adopters and teachers in soft sciences. Teachers that perceive to manage on their own are able to react faster to change in a technical educational context than teachers whose strategies are to rely on outside expertise.

8.4.3 Factors viewed as challenges in the change

Survey 2 and 3 questions, addressing teacher future plans and challenges in the change were selected for research question 4.3 to interpret and describe issues of concern when teachers face a major change in their teaching circumstances. The context in this case was the change from Blackboard to Moodle, and the respondents were teachers using Blackboard. This case was used because it raised discussion and collected qualitative comments. Respondents were specifically asked to describe their top three challenges in changing web-based learning environments, and they were additionally able to comment on perceived issues in open-ended questions in autumn 2008 and 2009, as well. As a result, the open-ended writing opportunities provoked responses that concerned the context but not the question focus. The responses to each question were categorized in themes individually, and themes were then combined. For the outcomes of the analysis, five thematic categories were selected, as presented in Table 8.22. In addition to the presented themes, a number of respondents mentioned not facing any challenges; they were happily abandoning Blackboard and changing to something else.

Table 8.22. Categories of perceived challenges and worries concerning the forthcoming change.

Factor category	Number of comments
1 Tasks included in the process as a whole	164
2 Time and work load that these tasks would require	37
3 Unawareness of what would happen	54
4 Pedagogical concerns	47
5 Motivation issues, anxiety, and frustration about the mandatory adoption	56

The future process of change came up as the most important issue, which could also be considered practical thinking. The new system—whatever it would be (Moodle was mentioned by some)—should be learned and understood for the needed purposes before it could be used in teaching, and some respondents were even concerned about having to teach it to colleagues. Learning a new system would also require active forgetting about the old one. The concrete re-implementation of all the needed contents in the new system would follow.

Time, workload, and resources are required in learning a new system and re-implementing the needed contents. Teachers were concerned about whether they would have the time needed, perceived as time away from other tasks. Uncertainty concerning the amount of the required time was an additional concern. Teacher time was not perceived to be used for adopting new systems, and part-time teachers would have to do it on their own time. The attitude concerning the workload was affected by the awareness that previously done work had to be re-done. Extra funding or resources would have been needed in the faculties to get the work done.

Unawareness targeted either generally to the difficulty of estimating what should be done, to the existing contents or the new system. Evaluations and feedback needed to be saved. The course areas that had been archived and research or teaching material repositories would be lost. In addition, loss of information was a concern in situations where teachers changed. The new system raised technical concerns about unawareness of what properties there would be, as well as the continuance of received support. Teachers were also concerned about forgetting how to use the new system due to their casual use.

Pedagogical issues concerned how the change would affect overall pedagogical development; the change was perceived as starting from the beginning instead of being able to develop the course contents or working methods. Informing students and teaching them how to use the new system should be done before the teaching could begin.

Teachers perceived *motivating themselves or others* to the change as difficult, as well as feeling general enthusiasm. There was even general anxiety and frustration about the change; it was difficult to give up the familiar system, though some would be ending their teaching anyway. The general credibility of centralized actions would be lost.

Additional issues providing insight on the adoption process included teacher worries concerning lack of practice in web-based teaching in their work communities and cultural issues in departments. These issues were categorized under two themes: 1) needs and 2) lack of practice. There were

1. Needs for
   1.1. Easing the future: readymade solutions
   1.2. Saving history: archiving
2. Lack of practices in changing
   2.1. Teachers
   2.2. Courses

1.1 Need for readymade solutions: The strong unawareness visible in Survey 2 was little explained by open comments, but two respondents made a good point of requiring comparisons and centralized, faculty, or department solutions for teachers in using web-based learning environments. Additionally, when discussing contents that needed to be migrated, teachers indicated that they would change to the new dominant system or to one that the department selected and thus recommended for its teachers. In fact, it was perceived as meaningful for everyone to use the same system. Teachers expressed that they do not have the time to learn about and test all the available options, leading to a lack of information and vision, which they perceived as making deciding on pedagogically sound choices more difficult. Putting each individual teacher in the position to select may increase teacher workload or produce non-meaningful selections with respect to the original pedagogical needs. Additionally, it should not be included in the teacher workload if centralized solutions exist.

1.2 Need for archiving: Old course areas are often kept as archives. The history of teaching and practices is perceived as important from the teaching development perspective, as well as for personal history. Though the awareness of what to use instead of Blackboard increased overall and in favor of Moodle, some teachers lacked awareness of what the change would actually imply. The change would not only be a best system recommendation used because of social recommendations but old contents would indeed disappear without the teachers' taking action. This is typical but disliked scenario in IT; end-users would prefer to accumulate archive information by doing nothing as a purposeful decision, but in this case, the end-users had to be active in archiving their own histories. A systematic way to save the information on past courses as a teaching history would support teachers in reflecting on their teaching and development as teachers.

2.1: Lack of practices in changing teachers between two subsequent course instances included worries from a) the predecessor and b) the successor ends of the chain and from c) the departmental perspective. Those respondents in Survey 3 who would not change their teaching to Moodle explained their responses with personal situations: they would not be teaching or even employed at the university in the future but assumed that their successors would make the required decisions. Some large courses had multiple teachers, of whom one was responsible, and some respondents indicated serving as assistants or otherwise in secondary positions and thus unable to make a decision on the future learning environment themselves. Some of them even explicitly mentioned leaving the responsibility to others.

When discussing existing Blackboard contents in Survey 3, teachers addressed their good practices in course collaboration at the personal or even the department level. Teachers used the same course areas when teaching courses and assumed that their successors had used the course area after them. However, when the system in which the course areas were established was designed to be phased out, the respondents were worried about the lack of existing practice in taking care of the commonly used course areas.

Some departments have large courses with multiple teachers, of whom one is responsible for the course. The responsible teacher should be responsible for the course area as well; otherwise, no one takes that responsibility. In some units, a course secretary takes care of all course areas on behalf of the teachers, and sometimes the collaboration and responsibility issues are clear, e.g., in the ICT Driving License course. However, it seems that most departments lack structures and processes in taking care of their courses' web-based areas. Especially when there are changes in the personnel, information flows break or no one is interested in the existing areas, which might be a result of a large amount of work and pedagogical development that would ease the work for the next teacher. These types of issues are emphasized when a major change takes place, but it does not have to be a system phase-out; it could be merely a normal change of teachers in a course. If teachers in a department are allowed to use any system they like, the result may be that students must learn and use a variety of systems. Additionally, the old system might be, e.g., the previous teacher's home directory or personal web pages, where the successor teacher cannot access the contents, or a closed system that requires privileges. Departments should create instructions and agreements or even contracts on how to forward course materials, such as plans, schedules, assignments, and course areas, from the predecessor to the successor so that teachers explicitly do or do not give permission to use their material in future courses, and the successor teacher will have access to them all.

Teachers discussing their Blackboard contents revealed that they had not created their own course areas and could in fact barely use them with students. They had obtained permissions from previous teachers or someone else who had created it. A possibly problematic result of course collaboration and course area recycling is that only the teacher responsible for the course participates in training or reads instructions, while the others do not. The teacher following the course designer might end up with a course area she does not know how to use. The same problem might arise when another person, such as a course secretary, creates the course areas on behalf of the teachers. Many teachers want to manage on their own and assume that they know how to use the system; many teachers do, but some do not.

2.2 Practices on changing courses: Teachers who teach the same courses year after year have different practices between courses. Teachers who use the same contents year after year reuse the course area with static contents. Teachers mainly need to edit the course material every time, so they create a new course area for each course implementation. When the course contents are simple, such as PowerPoint slides and discussion instructions, it is perceived to be easier to start from scratch than to edit an existing course area. This reveals the simple use of the systems in only distributing material, also referred to by the teachers as practical, without any extra “sociability.” These static contents should be published and maintained in a simpler system offering visibility and version control instead of a web-based learning environment. Additionally, these teachers would benefit from readymade solutions as activators for development. On the other hand, creating a new course area is perceived to be an opportunity to develop the course and learn about new system features. Teachers who develop their courses with awareness can probably also get ideas from the readymade solutions discussed above.

8.4.4 Experienced users’ orientation to the variety of technology

This section presents results for research question 4.4. Experienced users with experience on various technologies in teaching had also witnessed a number of changes in the technologies used. As part of it, the role of the work context was touched on in the interviews, though it was not the focus of the interviews. It was obvious that teachers teach within the context of their communities, which affects their work in one way or another. The role of the community was perceived as either supportive in enhancing teacher opportunities for teaching or uncertain because of unawareness of what would be included in their role compared to their teachers. The overall situation at the University of Helsinki with multiple technological systems was perceived as confused; systems come and go.

> *“It feels that this university is a test bench for beta testing; [the university] gets a program cheaply because [the vendor] gets a huge number of test users […] and then we test it and then they develop it and then it maybe works. […] And then these educational systems that are meant for our benefit are also so easily perceived as a burden. […] so getting motivated of [all new systems] is very difficult” [Interviewee 10, bio and life science]*

The adoption of technology in teaching, including a phase of learning in addition to technical also from the pedagogical perspective, is easily perceived as an extra burden. Because systems come and go, nothing is learned in detail.

> *“They come and go, and this one, this will hardly be the one; probably something will come after this one, too. You can always learn about them, but there are no systems anymore that you would know everything about. You know something about those features you need, and then there are lots of things in the dark, so you don’t know what all you could do and how you would do it.” [Interviewee 6, bio and life science]*

Most users want and need routines. They want to get used to the provided systems instead of constantly changing and learning new systems. This is a challenge from the system development and personnel training perspectives, as well.

> *”[It would be good] not to change them all the time so that the existing one will stay for a while.[… It would ease] this information obesity where you have too much of everything. If you know something by heart, you value it so much. So the benefit of getting something done in a handy way in a new application has such small value when you have to bother yourself to learn it.” [Interviewee 10, bio and life science]*

Especially because of the large variety of systems, the faculty and department should support its teachers in selecting and recommending systems. The decisions on what systems to use in teaching should be made on the department level instead of teachers making their own decisions.

> *“I just decided […] no one here wanted to adopt Moodle, but then I started using it anyway.” [Interviewee 10, bio and life science]*

If the department role is weak, teachers have to take more responsibility for their work and make decisions that actually should be made on the department level. This increases individual teacher workloads and affects the department workload correspondingly.

> *“It feels as if the central administration and educational support is a huge medusa living its own life, and then we serve it so that they can have their questionnaire projects and such, so sometimes I just get so distressed.” [Interviewee 10, bio and life science]*

Department heads should be aware of what is needed in their fields of science, and teacher communities could together or with specialist assistance define what systems and methods are needed and then use them.

> *“I think that the bosses are a bit stupid as donkeys in how IT could enrich teaching. So they kind of don’t know anything about it. So they can’t be enthusiastic about it, either.” [Interviewee 7, bio and life science]*

In addition to teachers, department heads and other management should be educated as well. Other ideas that departments could further benefit from are department-level designs and processes. For example, department-level course area layouts are perceived as good for teachers and for students.

> *“I think it’s* really *good because that’s what students have complained about previously, that all courses had different systems and different views, so I think that [department-level design] is really good. I don’t agree with all parts of it […], whether it’s good from all angles, but the good thing is that it’s standard and [every page] looks alike. That’s what it’s good at.” [Interviewee 11, science]*

Department-level design could go further in taking changing teachers into account by sharing course material in advance.

“We have started […] to collect all course material there [in a group directory …] so anyone can read it […], and then it becomes, in principle, the university’s property.[…] So if someone else has the same course, then they have all the material available.” [Interviewee 11, science]

Providing technology to be used in teaching at the University of Helsinki is not perceived as systematic. There are departments with routines and best practices and departments with no awareness on teachers’ needs. Teachers discuss issues in coffee rooms, and rumors go around. Very basic system properties, such as learnability, make the ultimate difference between technological systems used in teaching, not individual system properties. As a consequence, colleagues and work communities play a more significant role than centralized support.

”You [at the Educational Technology Centre] provide us with splendid support, fast response times, but that does not at all help the teacher in a situation [on a campus or faculty] with an unwilling boss and too little resources.” [Interviewee 7, bio and life science]

This could be seen in the survey results as well. What would be needed for further teacher development from the organization are resources.

“You should be able to try to invent […], but then very many have stopped on the road, so they just don’t… bother or have the time. […] It’s a bit of a shame that you kind of test once and then it’s over. So my wish would be that the university would find proper support mechanisms.” [Interviewee 7, bio and life science]

Personnel training is a traditional method of increasing teacher knowledge on systems in general and especially when changing systems. But there are challenges in trainings, as well.

“I noticed on the [advanced] training [on Moodle …] that, when people with terribly different background knowledge come to the training, […] immediately when the contents go beyond the basic level of what you can do with the system, then you should actually start with the needs of each individual in the training [which is impossible].” [Interviewee 10, bio and life science]

Correspondingly to learning and teaching approaches, the needed support should be faculty-based.

“Faculties have their basic themes in the challenges of teaching, different between faculties […], but within a faculty, there would probably be such hegemony that it would feed the idea as well.” [Interviewee 7, bio and life science]

Instead, for example, a personal trainer for supporting individual teachers in their development would be a fresh idea.

”It would be lovely to have such a person [here] who would know some pedagogy and have some control over the tools. And then we could tell her about our courses and working methods, and it could be an interactive situation where she

could then suggest this or ask what you would like to do or first listen to her suggestions." [Interviewee 10, bio and life science]

Instead of occasional support based on specific needs, such as centralized support via email, personal trainers could have long-term customers whom they would train. The trainees would later manage themselves and act as trainers for further teachers. Some of the e-learning support persons probably are this type of personal trainers, but many faculties lack e-learning support. It might even be that some teachers would benefit from knowledge not existing in their own faculty, and trainer trade-offs between faculties would support both parties. Additionally, personal training agreements would be official with contracts and goals, which would increase target-oriented and systematic methods and thus teaching quality.

If teachers work alone without methods on how to follow overall development and the department role is weak, teachers fall behind in educational technology and technical awareness. Collaboration is an important means of increasing awareness, and departments and faculties should enhance it purposefully. A positive exception were the natural scientists, of whom all collaborated with their peers.

Generally, departments expect individual teachers to decide too many things. Processes and models should be developed and taken to use as best practices if there are no better ideas. Departments should take a stand on what their teachers need and provide management support for teaching design. As presented earlier, there are gaps in teacher awareness on the use of educational technology. Departments should intentionally fill in the gaps to develop the quality of their teaching and create systematic processes for teachers to follow.

The only users who considered changes in technology as normal development were those with a focus on educational development, i.e., with a level 3 teaching focus and extensive technological innovativeness. As they want to have teaching designs that support the desired learning goals separately on each course, they search actively for suitable solutions and create solutions themselves.

"In fact, we think we have this year developed a revolutionary course concept, but of course, we won't tell the students that it's for the first time." [Interviewee 1, science]

They develop their teaching with awareness, not afraid of even radical changes.

"I had lectured [the course] three times, and it felt like… a waste of time, and then I radically renewed it so that it had no lectures at all." [Interviewee 5, science]

These users have to be pedagogically and technologically aware, be technologically innovative, and have educational courage in their teaching. Because their pedagogical needs are well-motivated, they are able to tailor their technological solutions based on the needs. Therefore, the overall profile of experienced users orienting to change can be simplified, as shown in Figure 8.10. When the focus on teaching with technology—or the overall focus on teaching—is on educational development, then changing systems is something that goes on and is perceived as normal. In fact, there is no "changing" when course planning starts from pedagogical goals, the system is selected based on pedagogical needs, and the implementation starts from scratch.

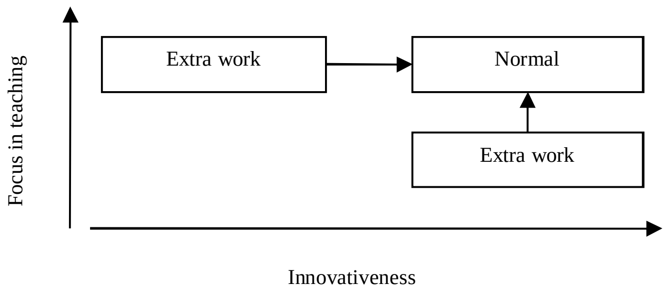

Figure 8.10. Experienced user orientations to the variety of systems.

Overall, from the experienced user perspective, the change from using Blackboard to using Moodle was from a system *"you could live with" [Interviewee 6, bio and life science]* to a system *"I cannot not imagine being without in any long-term course" [Interviewee 3, human science]*.

9 Discussion

In this final chapter, the results are summarized, the possibilities provided by the results for the development of education are discussed, and suggestions for the future are provided. Teachers as users and adopters of technology in teaching at the University of Helsinki were in the focus of this study, and the situation was investigated through theories on users of systems (Nielsen, 1993), teachers' focus on teaching (Biggs, 2003, p. 20-33), teachers' approaches to learning (Paavola & Hakkarainen, 2005), and the diffusion of innovations (Rogers, 2003). The research questions were addressed with quantitative and qualitative methods. The sections mainly follow the order of the research questions.

9.1 Teachers using technology in teaching

In this first section, the results for research questions 1 and 3 are discussed. Teachers gain experience on web-based learning environments by using them in their teaching, collaborating with other teachers, and participating in personnel training. Reading books and instructions on web-based learning environments is also good for increasing knowledge on the subject, but developing practical expertise comes only from experience.

Teaching personnel expertise on web-based learning environments at the University of Helsinki was modeled with Nielsen's (1993) User Cube dimensions (pp. 43-48). The teacher expertise profile was characterized by a majority of users with casual overall use and expertise, called the mainstream users. The reason for the casual mainstream use is university teachers usually having one or sometimes two courses per academic year. The number of active course areas thus never increases. The natural amount of teaching in an academic year offers little opportunity to gain and increase experience in web-based methods; the cycle of course development is one year or even two for each course. If the development ideas and experiments are not written in notes on time, the ideas and practices are forgotten before the next course starts.

The original User Cube was enriched by the author by adding three more dimensions between the each of existing dimensions to illustrate advanced teacher expertise in more detail. The results showed two different profiles of users, namely one for a new system, i.e., Moodle, and one for a system that has been used for years, i.e., Blackboard. The Blackboard profile emphasizes that the methods used are easily retained in repeating the same ideas course after course, i.e., without development in teaching. The Moodle user profile is more versatile, showing users who know what they are looking for in a new system but also illustrating the profile of a small number of users.

The overall teacher profile at the University of Helsinki included the majority of mainstream users who underused the properties of the provided systems and a minority of advanced users with various needs. Therefore, the system features provided and the user profile in use were not always a match. Teachers with the most expertise do not use centrally provided systems anymore, and teachers with a basic level of expertise do not yet have all the pedagogical and technical knowledge and interest required for making the most of web-based learning environments such as Moodle. On the other hand, the versions of Blackboard and Moodle used in this study included few features supporting a trialogical learning approach. Users who rely on the organization in selecting recommending systems for pedagogical purposes may not all understand that the systems are not complete.

When the presented results on teachers as users of technology in teaching are combined with the features provided, a usage profile for technology in teaching can be drawn, as presented in Figure 9.1. The usage profile illustrates how the teacher profile on X-axis is related to the provided technology in teaching on Y-axis. The teacher profile consists of a majority of mainstream users as 1a in the figure and a minority of advanced users as 1b in the figure. The number of technological features consists of features provided by a web-based learning environment system for overall use, illustrated by the constant horizontal line as the limit, and additional features provided by other systems. According to the results, there is a gap (2 in the figure) between mainstream users and features provided by the centrally maintained system. A small number of advanced users benefit from most of the features provided by the system, and experienced users need technology and features not provided by the centrally provided systems, so they come up with their own solutions.

Further, Figure 9.1 includes three suggestions (3a-3c) for development directions that would increase the use of centrally provided web-based learning environments:

- 3a) Development of system features so that the provided systems would support a wider range of pedagogical needs
- 3b) Support for and development of mainstream users’ use of technology in teaching

- 3c) Increase the number of users of provided systems, which can be developed by the two previous and suggestions presented as follows

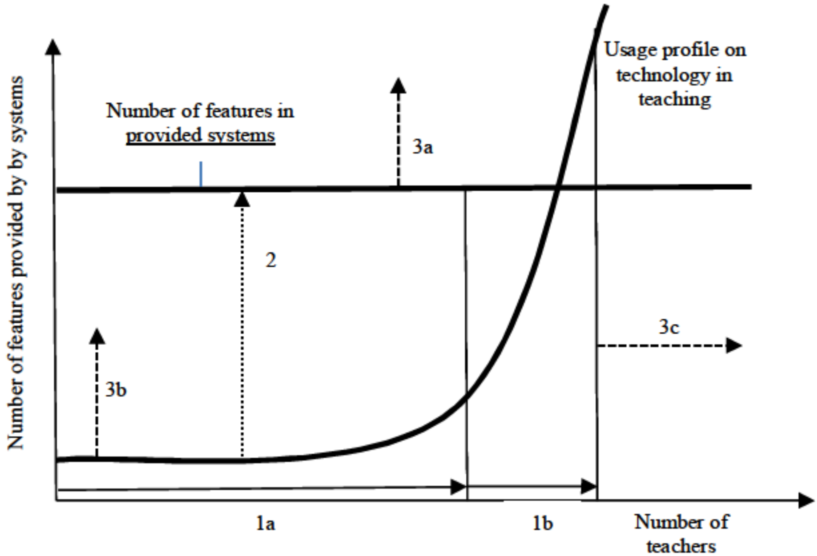

Figure 9.1. An overview on the usage profile on technology in teaching, including the majority of mainstream users (1a) and the minority of advanced users (1b), the gap between mainstream use and possible features (2) and possible development directions (3a – 3c) for support actions.

The development of system features should be focused in a way that provides possibilities for versatile learning with possibilities for monological, dialogical, and trialogical learning (Paavola & Hakkarainen, 2005). In particular, features that support trialogical learning are few in existing systems. Such features would further give required features for advanced users who presently use other systems or combinations of systems and for additional new users who have not used technology because it does not provide perceived values.

The development of the expertise of the majority of mainstream users would make the usage of provided systems more versatile. Teacher development of pedagogical expertise requires constant, aware, active, and bold renewal. This is not what most teachers do. There are teachers who are satisfied with pedagogically and technically with simple solutions but also teachers who want more complex solutions. Based on the results, instead of providing a “one system fits all” solution, a good practice would be to provide two alternative systems with centralized support: one interoperable, secure, basic, and still pedagogically sound solution for long-term and mainstream teachers who want to take the basic route and another solution for experienced teachers who have special needs and know what they want, providing versatile possibilities for special needs on short-term use. This secondary solution could be more complicated in structure and use, possibly consisting of a combination of systems. It is likely that the secondary systems would include third-party applications in addition to centrally maintained systems, but these possibilities are the focus of a future study. This would, in addition, require department practices.

9.2 Experienced user focus on using technology in teaching

This section discusses results concerning research question 2. Based on the interviews, there were three main ways that experienced teachers focus their thinking when using technology in teaching:

- Technical imbalance where the emphasis is on technical issues, even at the expense of pedagogical meaningfulness and goals
- Pedagogical imbalance where the emphasis is on pedagogical goals with little technological innovativeness that would enhance reaching the goals
- Aware, balanced focus between technological and pedagogical issues

It is easy to focus on only one of the dimensions, especially based on one’s own interest, at the expense of the other dimension. Gaps between the two dimensions result in various kinds of constructively unaligned teaching and implementations with a lower-level focus on teaching than based on teacher theoretical pedagogical knowledge would be expected. An imbalanced focus in using technology in teaching may even result in providing students with different learning experiences than with a balanced focus.

Teachers with a pedagogically imbalanced focus on technology in teaching use technologically simple, pedagogically motivated methods and benefit from systems that are easy to learn and use. Even with moderate innovativeness and courage, it is possible to be skillful in using provided systems along with the more complex features and to benefit from them with strong practical teaching skills and sound pedagogical goals. The *focus on pedagogical goals* category is where the majority of teachers’ knowledge should be aimed. With Biggs’ level 3 focus on teaching (Biggs, 2003, p. 11-

33), these teachers are stronger than their colleagues in pedagogy. As such, they should also be stronger in attitude and awareness in the use of technology in teaching to influence their communities toward increasing the pedagogically meaningful use of educational technology. As change agents or opinion leaders, these teachers should preferably be socially central in their communities (Rogers, 2003; Ryymin, 2008). As such, they should be benefitted from in systematic educational development in departments and faculties as they adopt systems, apply them in their teaching, and share their knowledge in their communities. This category is important in supporting the rate of adoption and best practices for using technology in teaching.

The challenge with a pedagogically imbalanced focus is the lack of practical technical courage that would support them in further technology use and methods even for trialogical learning (Paavola & Hakkarainen, 2005). They select their technological solutions from among the recommended systems based on external expertise. Therefore, systematic collaboration with e-learning support is important for both easing teacher workload and the teacher's development. The role of the technological aide (Rogers, 2003) becomes essential, and course development depends on their knowledge. If the technological aides are aware and skilled, this method also increases the teachers' technological awareness when they learn more about technology. However, gaps in an aide's pedagogical and technological understanding correspondingly affect the course area design, and course design in turn. Here, the community should be aware of the essential roles and train the key persons properly; this will yield returns in pedagogical course designs, decreased teacher workloads, and increased teacher technological knowledge.

Teachers who have used technology in teaching for years easily perceive value in the technology: it is easier for the teachers to teach with technology than without. This is also a potential pedagogical challenge for teachers with a technologically imbalanced focus on teaching with technology: if these teachers focus on their part of the teaching–studying process instead of considering what would benefit students. Therefore, teachers may stay at Biggs' (2003) level 2 in their teaching approach (p. 11-33), though they would have the pedagogical knowledge for level 3 teaching and technological skills for complex solutions. If the reason is a heavy cognitive load, the results are simpler teaching designs than the teachers would have been capable of. They might be at level 3 if they took the trouble and courage; technology is another disturbing factor in their teaching. Education in university pedagogy might not break the strong routines of using technology in teaching but instead mix teacher thinking. It is a shame if they use a great deal of time and effort on pedagogically meaningless work that results, more often than not, in surface learning results. The challenge with technological experimenters is that, when they work alone, educational technology specialists do not reach them with the same social methods as other teachers.

The results concerning experienced users' focus on teaching with technology illustrate individual user thinking, not individual users' development in time. However, the model supported by the results provides information on different types of teacher focus on teaching that can be used in supporting teachers' further development toward a balanced focus at the organizational level. The model of teacher focus on using technology in teaching can be presented with further development directions, as illustrated in Figure 9.2.

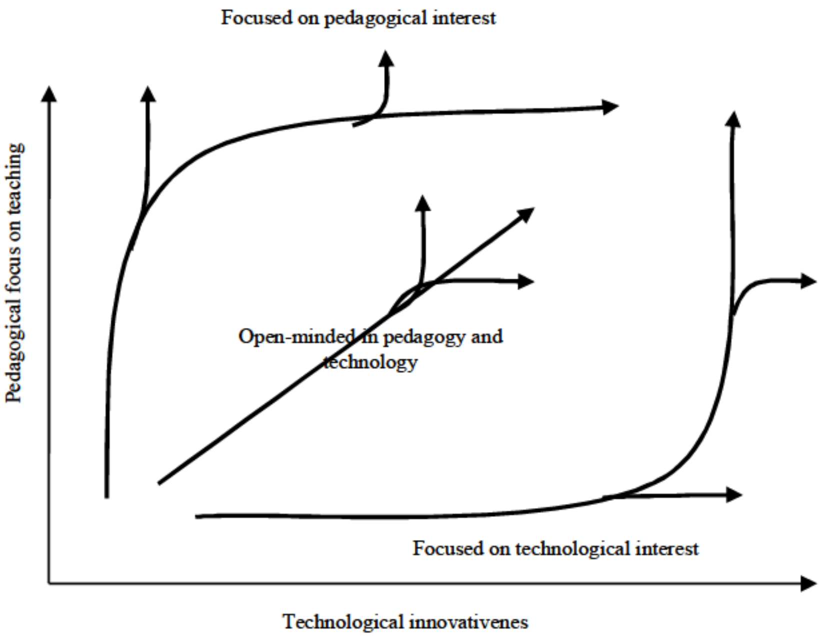

Figure 9.2. Possible directions on teacher focus in teaching with technology.

The teacher population of this study builds a pyramid in their skills and knowledge, with most teachers on the lower, basic levels and fewer teachers on the higher levels, requiring more skills and knowledge. Skills including only pedagogical perspective with Biggs' (2003) level 3 teaching and understanding of constructive alignment (p. 11-33; Biggs & Tang, 2007), or skills including only technological perspective with innovativeness (Rogers, 2003; Nielsen, 1993) and interest, proved to be insufficient for the pedagogically meaningful use of technology in teaching. The essential elements found in the study as the factors that make the difference between the basic and the experienced level of pedagogically oriented and modern teaching with technology were:

- Collaborating and brainstorming with peers in teaching design
- Courage to expect students to exceed their comfort zones
- Making the learning process truly transparent with the help of technology
- Selection of systems based on pedagogical needs that create trialogical learning.

These skills combine teachers' theoretical pedagogical knowledge, content learning goals, and technological implementation methods into meaningful wholes. Educationally brave teachers could also make their students exceed their comfort zones and clearly give them responsibility for issues they had to learn to take responsibility for, while educationally uncertain teachers had an unclear distribution of responsibility between themselves and the students.

The expectation that teachers will develop in their skills and knowledge along with their teaching routine is too simple. It does not matter how much teaching experience and what technological skills teachers have if they are not interested in applying their skills and knowledge to their teaching. The results indicated that two primary obstacles held teachers back from using technology in their teaching in a pedagogically meaningful way: a lack of pedagogical motivation in teaching and a lack of technological interest and innovativeness. Only those teachers who actively train themselves in areas they know they are weak in develop their teaching in a systematic way. They push themselves out of their comfort zones with awareness, which also requires the courage to deal with uncertainty.

Pedagogical personnel training courses in university pedagogy are included in strategic teaching development at the University of Helsinki (University of Helsinki, 2009b). However, the use of technology in teaching is done on a voluntary basis. This affects teachers in their goal-oriented development of expertise. Teachers' expertise as providers of modern teaching with technology consists of two separate directions that do not easily combine. As teachers' focuses on teaching with technology are imbalanced in two dimensions, training to achieve the desired expertise should be designed for the two groups separately. Then, technologically imbalanced teachers will expand their pedagogical thinking, and pedagogically imbalanced teachers will expand their technological understanding. Further, teaching designs should be verified with systematic peer and expert methods for goal-oriented educational development.

The University of Helsinki also has two units for teacher expertise development that are strategically placed separately: the Educational Technology Centre under the central administration and the Research and Development Centre for University Pedagogy in the Faculty of Behavioral Sciences. To support teachers in developing their teaching expertise in a balanced way through a combination of pedagogy with educational technology, stronger bonds and collaboration between these two units should be discussed in the future.

9.3 Teachers as adopters of change in technology in teaching

The context of the Moodle adoption revealed common working methods and habits of teachers as users of these systems. The results for research question 4 illustrated two main adopter categories with different working strategies. The identified adopter categories were not defined by the theoretical adopter categorization by Rogers (2003, pp. 279-299) but were instead identified by their different characteristics as Mahajan et al. (1990) suggested. Thus, two main adopter categories were identified. The first main adopter category, called early adopters, preferred working alone with the help of web-based instructions. The other main adopter category, called the majority, were instead interested in interpersonal methods such as training and contact with support personnel and peers. A comparison of the characteristics of these two adopter groups is presented in Table 9.1. A third, minor adopter category, called the early majority, was small in number, located between the early adopters and the majority and close to the majority in characteristics. The group of laggards, typically presented as the last category by the theory on the diffusion of innovations (Rogers, 2003, pp. 279-299), was expectedly missing. This was because the data included only teachers who had used web-based learning environments—the laggards presumably had not. In this respect, the adoption process was still going on and incomplete at the time of writing this study.

Table 9.1. Comparison between the two main categories of adopters found in the study with their typical characteristics.

Dimension	Adopter category	
	Early adopters	Majority
Preferred orientation	Manage by themselves	Rely on external expertise
Communication channels	Cosmopolite	Localite, interpersonal
Variety of communication	Limited with backup	Preferably a variety
Schedule in adoption	Fast	Slow, hesitant
Technical orientation	Interested, innovative	Moderate, conservative
Pedagogical focus	Less	More
Typical fields of study	Natural science	Human sciences

According to the findings, teachers were aware of their personal learning and working methods. Teachers who already had managed on their own in learning and using web-based learning environments wanted to continue doing so, and teachers who appreciated external expertise preferred to continue with that instead of learning by themselves. Additionally, the early adopters were more independent in their working methods than the majority, who relied more on external aides. The early majority group presented some development in working methods toward the more independent early adopter working style. The data used did not give enough information for further conclusions concerning development in the majority of teachers' working methods; a follow-up survey would be useful for this purpose in the near future.

The results suggest that teachers' preferred working strategies and needs for external expertise revealed in an adopting situation do not develop by routine gained from expertise but instead are based on their personal preferences, gained from the working culture in their working communities and from their ability to adopt new information. Some teachers appreciate training, e.g., because of trust in expert opinion, while others prefer to work by themselves at times that are suitable for them. The earliest adopters in the change were the most independent ones, and the slowest ones, who had not started at the time of the conducted survey, assumed that they would need external assistance. These findings are well in line with the general information on adopter behavior by Rogers (2003, pp. 279-299).

Fields of study influenced teachers' preferred strategies for adoption. Participating in teacher training and using local support was more typical on the city and Viikki campuses in human and bio sciences. Primarily working independently with the help of web-based instructions and contacting expert personnel only when perceiving the need was typical on the Kumpula campus in natural sciences. For faculty-based comparison, the respondent numbers were too small. In the future, the challenge in the university-based development of teaching is to reach those early adopters working alone who otherwise seldom seek assistance. The instructions on the web are essential in reaching independent teachers, and based on the results, the instructions were most typically used as a secondary method. Additionally, based on the theory of the diffusion of innovations (Rogers, 2003, pp. 279-299), late adopters would benefit from aides who close to them in characteristics.

In the future, the two categories of adopters presented should be taken as the starting point when designing support actions for upcoming changes in technology. The first adopter group should also collect best practices to be shared with later adopters. Further, change periods in the future should be short, though the rhythm of teaching periods must be taken to account. In addition, department support actions for later adopters should be agreed upon.

The results of the study, however, presented the large workload of university teachers, which makes it hard to provide good teaching in web-based learning environments as well as in face-to-face situations. The results presented respondents' worries about their overall working situation, fixed-period employment contracts, not being employed after a while, and what would happen with their course areas, all of them illustrating the cultural context of academic fixed-term employment as a whole. The issue is not only whether teachers see the pedagogical value in using web-based learning environments but whether they have time and effort to become familiar with them. The results indicate that the personal costs are too large.

Based on the results, teachers worked alone more than they wanted to. Teachers perceived they were expected to make individual decisions concerning their teaching without departmental alignment, concrete guidelines, or support. The findings indicate the need for a greater emphasis on local support and design in the faculties, even at the department and faculty level. Faculties, departments, and institutes lacked practices in the versatile situations included in the teaching processes outside actual teaching activities, or at least teachers were not aware of such. Instead, teachers perceived they had to determine their practices by themselves, resulting in teachers' increased workload and stress.

The situation of changing web-based learning environments is not the only or the most typical case where the departments and faculties should have policies and practices described as clear processes on what to do. When there is an existing process of what to do when something—the teacher, educational technology, or teaching methods—changes, the process for the change is easier to proceed with. Instead of burdening a large number of individual teachers with their own processes, departments should have a set of methods for taking care of and balancing the workload. In this way, all duties would also be visible in the teachers' individual and the department's overall working hours.

In some departments, there were good practices in creating common course areas for the whole department to use, each needing one responsible person. More common processes and agreements would have been required and appreciated at departments in supporting their teachers in managing their duties. The situation should be improved by practices agreed upon together in departments, essentially with the support of the heads of the departments. Department practices and rules of the game should be agreed upon for situations such as the following:

- Which system is primarily recommended and in major use as a web-based learning environment and what grounds there are for selecting something else
- What the practices are in changing the teachers responsible for a course and what types of information should be collected
- Who the responsible person/s is/are in the department taking care of the commonly created course areas
- What type of teaching information should be archived and how.

For example, the situation of changing teachers between two successive implementations of a course requires an exchange of information between the predecessor and the successor. Missing responsibility for the existing course areas and even awareness of their existence may result in problems with the continuity of teaching and extra work for the parties involved. Likewise, there were deficiencies in practices concerning the maintenance, storage, and archiving of course areas and other teaching information useful for the whole teaching community. Commonly designed and developed course areas provided for the teachers would most likely decrease problematic situations in changing teachers between succeeding instances of a course. If the teachers are owners of their course areas in a web-based learning environment, agreements on forwarding the course area to the successor are needed, including copyright, and preferably agreed upon beforehand.

Teachers had learned web-based systems and methods in adoption with two main strategies: on their own and via interpersonal methods such as courses and local e-learning support. The surveys and interviews included teacher comments that revealed that they could not use the provided system.

Teachers perceived that they were not able to focus on teaching when they had to proceed through laborious steps in learning to use the systems and the suggested methods. Either teachers had to use a great deal of time in becoming acquainted with opportunities to select a solution suitable for their needs or they were not motivated to use the time to try to cope as best they could with the resources they have.

When centralized and local support is designed, it is important to discuss and confront the goals of a variety of teaching methods with the reality of limited time and expertise. Open instructions and opportunities for versatile implementation possibilities may yield good results but also burden and frustrate teachers who would not want to take the time. In addition to human support resources, web-based systems should be used more in assisting teachers in the design and implementation of their teaching activities. A limited number of well-proven though simple alternative models that give good enough results with little time and effort would support casual users and even give them pedagogical ideas they otherwise would not know of. Course templates[46] provided for Moodle are a good example of such models, and their use and variety should be developed. Teachers who know what they want can ignore the provided ready-made suggestions and create course designs as they please. Other technical support alternatives could include a wizard for creating the course area with the help of assisting questions and even restricting the variety of the properties provided in the system based on user role—for example, roles for mainstream teachers and experienced teachers could be created in Moodle. The results of teacher course design should be assessed in light of the aligned teaching goals, similar to the feedback that teachers give to students in reflection on the course learning goals.

The initial problem at universities is the fixed practices concerning the organizing of teaching. It is difficult for teachers to renew their teaching if the departments do not provide aware, flexible structures and enhance development. If course design starts with placing the traditional number of lectures in the schedule, teachers must be aware well in advance and have the courage to break the traditions on purpose. Instead, aware development should be included in department routines in curriculum design. Departments typically already have personnel in charge of designing curricular and course practices. As teaching practices have expanded to include web-based methods, it would be natural to include practical issues concerning the web-based course areas. These key persons in departments should be supported,

[46] http://docs.moodle.org/all/fi/Kurssipohjat (8.3.2014)

and the selected support activities must benefit from local management support. In this way, teachers can concentrate on their main teaching duties.

9.4 Implications of development with future suggestions

In 2008, a large number of teachers used Blackboard. At the same time, some teachers had adopted Moodle in addition to Blackboard. Later, the results presented the ongoing trend to use Blackboard, in spite the knowledge of its being phased out. The adoption schedule was free enough to provide teachers the opportunity to continue teaching for years in Blackboard before adopting Moodle. The presented results concerning the adoption schedule indicate teacher needs for planning time before starting to use a new system in teaching. When designed well in advance, the actual change period can be short, such as one academic semester, and if possible, it should be allowed to be placed when it is most suitable for the users. When dealing with large end-user groups and heterogeneous educational needs, the preparation time should be counted in academic years. The design should take other academic scheduled events, such as changes in curriculums, into account and benefit from them. Additionally, the change schedule should be agreed upon with department heads and designed with their awareness.

The results emphasize the importance of strategic decisions on selecting and changing centrally maintained learning environments because teachers have little expertise on corresponding systems with limited time and opportunities to learn new software. Teachers do not want to change systems—they want to concentrate on teaching. The decision to phase a system out before major problems was respectable. The more complicated and system-specific data structures the software is implemented with, the more complicated it is to move the contents to next-generation systems. Therefore, the strategic selections on software must include knowledge of the whole system life cycle. Educational use requires technically solid and secure systems and infrastructure—otherwise, teachers struggle with technical problems, unable to focus on educational design, as shown in the results of this study.

A strategic decision to change systems used as web-based learning environments should bring pedagogical development and added value that motivate the change. The change from Blackboard to Moodle was a technologically developmental but pedagogically maintaining change, not a change that would increase development in university pedagogy. This should not be enough for educational organizations with strategic goals for educational development.

As the responses to the questionnaires and interviews illustrated, cultures in using web-based learning environments on campuses varied with respect to preferences for learning strategies and in numbers. The differences require correspondingly different adoption and learning methods for educational technology, and learning methods suitable for the field of science should be applied to the web-based methods as well. The faculties and departments should actively develop the application of content-specific web-based methods. Centralized support units can provide and develop systems to meet teachers' needs, but the needed methods must come from the faculties.

The development at the University of Helsinki is guided by technological factors at the expense of pedagogical needs. A strategic report issued seven years ago (Lavonen et al., 2006) expressed the pedagogical needs but justified the solution selection by technical characteristics. The change in web-based learning environments increased the technological service level but maintained the pedagogical service level. This suggests to the end-users that systems are actively developed technically, implying that they are not ready and are being beta-tested with end-users. Based on the results, systems provided for pedagogical goals are not even always learned in detail because they are perceived to change all the time.

Pedagogical research and development combined with many-sided technological solutions provide excellent opportunities for teacher development of expertise. Keeping in mind that pedagogical methods always guide the selection of web-based methods for teaching and learning processes, the rich supply of software and services makes it possible to compare and select the most suitable products for the organization's goals. However, in large organizations, the adoption of provided systems is slow and versatile. Using well-known methods of diffusing innovations through systematic networks of practice and peer support makes the distribution of information effective and increases the quality of teaching, making reaching the strategic goals real. Local specialists on web-based methods in faculties and departments are the key actors in creating best practices in their organizations. Teachers are experts in their fields of study, and their perceived added value in web-based learning environments should be distributed more effectively to strengthen the power of peer networks in educational development. Based on the study, recommendations for channels and processes for systematic educational technology development can be presented, but the recommendations should be tailored in every department to suit their needs.

A simple way to receive subjective information on issues of focus in development is to ask the end-users. The support perceived by the students for their learning processes should be a future theme for a student survey and a method for an annually repeated quality assurance check. Additionally, it is a way to show that end-users are listened to in the decision-making and that the participation results have a positive impact on the respondents' work.

As suggestions for the future and to enhance educational development, channels and processes for systematic user-centered educational technology development should be developed. To support this, three types of local actions should be taken:

1. Develop support methods for the profiled end-user groups that make it easier for teachers to adopt and use the selected systems in a time-consuming and pedagogically aligned way.
2. Develop systematic models and decision-making processes for the department management on how to use technology in teaching in a systematic way for the help of the teaching staff.
3. Provide pedagogically motivated suggestions for developing a wider variety of pedagogical features in existing systems by using existing additional modules and by starting strong local development based on pedagogical research and modern technological solutions. Since teaching in different fields of study requires specified pedagogical content knowledge, their web-based methods differ correspondingly. These web-based content-specific methods should be further investigated and developed together with pedagogically aware teacher end-users.

Based on this study, interviews could be continued at the University of Helsinki as well, with different and targeted selection criteria, e.g., teachers having 60 ECTS points of university pedagogy compared with teachers having subject teacher education or teachers accustomed to various Moodle versions. Further, the situations could be compared on a national level between Finnish universities. The next stage in the research should describe how teachers use the provided systems and features by comparing the situation nationwide between universities and polytechnics as well.

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Appendix A: Web-based learning environments used in Finnish universities, 2003–2012

University	Year		
	2003[47]	2006[48]	2012
University of Helsinki	WebCT	WebCT	Moodle[49]
Aalto University, former:			Optima[50] and Moodle[51]
Helsinki University of Technology	?	Optima	
Helsinki School of Economics	Optima	Optima	
University of Industrial Arts in Helsinki	?	FLE3, Moodle	
Swedish School of Economics	WebCT	WebCT, Moodle	Moodle[52]
Sibelius Academy	Optima	Optima	?
University of Turku	?	WorkMates, WebCT	Moodle[53]
Åbo Akademi University	Blackboard	Blackboard, Moodle	Moodle[54]
Turku School of Economics	WebCT	WebCT	Moodle[55]
University of Tampere	WebCT, Moodle	Moodle, WebCT	Moodle[56]
Tampere University of Technology	?	A&O, Moodle	Moodle[57]
University of Jyväskylä	Optima, PedaNet	Optima, Moodle	Moodle[58]
University of Eastern Finland, former:			Moodle[59]
University of Joensuu	WebCT	WebCT, Moodle	
University of Kuopio	WebCT	WebCT, Moodle	
Lappeenranta University of Technology	WebCT	WebCT	Blackboard→ Moodle [60,61]
University of Oulu	WebCT, Optima, LC-prof	Optima	Optima[62]
University of Lapland	WebCT, Optima,	Optima	Optima[63]

[47] Lavonen et al., 2006
[48] Lavonen et al., 2006
[49] https://moodle.helsinki.fi (8.3.2014)
[50] https://optima.aalto.fi (8.3.2014)
[51] https://moodle.aalto.fi (8.3.2014)
[52] https://moodlenew.hanken.fi/moodle/ (8.3.2014)
[53] https://moodle.utu.fi/ (8.3.2014)
[54] http://moodle.abo.fi/ (8.3.2014)
[55] http://moodle.utu.fi (8.3.2014)
[56] https://learning2.uta.fi (8.3.2014)
[57] http://moodle.tut.fi (8.3.2014)
[58] https://moodle.jyu.fi/ (8.3.2014)
[59] http://moodle.uef.fi (8.3.2014)
[60] https://moodle.lut.fi (8.3.2014)
[61] Personal conversation
[62] http://optima.oulu.fi (8.3.2014)

University of Vaasa	FLE3 WebCT	WebCT, Moodle	Moodle[64]

[63] https://optima.lapinkampus.fi/ (8.3.2014)
[64] https://moodle.uwasa.fi (8.3.2014)

Appendix B: Survey questionnaires

Survey 1: Questionnaires 1 (Blackboard) and 2 (Moodle)

Blackboard-oppimisympäristön käyttäjäkysely opettajille - kevät 2008

Verkko-oppimisympäristöpalvelun toiminnan kehittämiseksi Opetusteknologiakeskuksen ja Tietotekniikkaosaston oppimisympäristötiimi kerää palautetta Blackboard-oppimisympäristön käyttäjiltä. Palautteen käsittelee oppimisympäristötiimi ja tulokset julkaistaan Opetusteknologiakeskuksen sivustolla kevään 2008 aikana.

PERUSTIEDOT

Etunimi

Sukunimi

Sähköposti @helsinki.fi

* Tiedekunta --Valitse tästä--

Valitse rooli, jossa pääasiallisesti toimit käyttäessäsi oppimisympäristöjä? Opettaja

* Kuinka monella eri kurssilla olet käyttänyt Blackboad-oppimisympäristöä? --Valitse tästä--

Onko sinulla käyttökokemusta muista oppimisympäristöistä kuin Blackboardista? Jos on, niin mistä?

BLACKBOARD-OPPIMISYMPÄRISTÖN KÄYTTÖÖNOTTO

	Erittäin helppoa	Helppoa	En osaa sanoa	Vaikeaa	Erittäin vaikeaa
Kuinka helppoa oppimisympäristön käyttöönotto oli?	○	○	○	○	○

Halutessasi tarkenna vastaustasi

	Erittäin hyvin	Hyvin	En ota kantaa	Huonosti	Erittäin huonosti
Oppimisympäristön tukipalvelut on järjestetty...	○	○	○	○	○

Halutessasi tarkenna vastaustasi

BLACKBOARD-OPPIMISYMPÄRISTÖN KÄYTTÖKOKEMUKSIA

Arvioi oppimisympäristön ominaisuuksia. ?

	Toimii erittäin hyvin	Toimii hyvin	En osaa sanoa	Toimii huonosti	Toimii erittäin huonosti	En ole käyttänyt em. toimintoa	tar all
Kirjautuminen	○	○	○	○	○	○	
Kurssialueen rakentaminen	○	○	○	○	○	○	
Opiskelijahallinta	○	○	○	○	○	○	
Vuorovaikutus ja keskustelu	○	○	○	○	○	○	
Opintotehtävien hallinta	○	○	○	○	○	○	
Tenttiminen	○	○	○	○	○	○	
Oppimateriaalin jakaminen	○	○	○	○	○	○	

Mitä oppimisympäristön tarjoamia ominaisuuksia / työkaluja olet käyttänyt järjestämiesi kurssien aikana?

- ☐ Oppimateriaalin jako
- ☐ Opintotehtävän palautus kurssialueelle
- ☐ Keskustelufoorumi
- ☐ Instant message -pikaviestitoiminto
- ☐ Sähköinen tenttiminen
- ☐ Kalenteri
- ☐ Chat
- ☐ Sanasto
- ☐ Ulkoiset linkit
- ☐ Uutisvirrat eli RSS-syötteet
- ☐ Opintotehtävien / tenttien automatisoitu arviointi
- ☐ Opiskelijoiden aktiivisuuden seuranta

Jos edellisistä vaihtoehdoista puuttui jokin käyttämäsi työkalu, mainitse käyttämäsi työkalu(t)

Jos oppimisympäristön tarjoamat työkalut ovat mielestäsi puutteelliset, mitä työkaluja kaipaat?

	Erittäin hyvä	Hyvä	En osaa sanoa	Huono	Erittäin huono
Arvioi oppimisympäristön tekninen toimivuus	○	○	○	○	○

Halutessasi tarkenna vastaustasi

	Erittäin hyvä	Hyvä	En osaa sanoa	Huono	Erittäin huono
Arvioi ympäristön pedagoginen toimivuus	○	○	○	○	○

Halutessasi tarkenna vastaustasi

BLACKBOARD-OPPIMISYMPÄRISTÖN JA SEN TUKIPALVELUIDEN KEHITYSEHDOTUKSET

Kerro, kuinka oppimisympäristöä tai siihen liittyviä tukipalveluja voitaisiin kokonaisuutena kehittää nykyisestä? Kerro esimerkiksi koulutustarpeista, integraatiotarpeista, lisätoimintotarpeista ym. seikoista.

TIETOJEN LÄHETYS

Tallenna | Esitäyttö URL

Survey 2: Questionnaire 3 (Blackboard)

Kartoitus Helsingin yliopiston Blackboard-kursseista 2008

Tervetuloa vastaamaan Blackboard-kursseja koskevaan kartoitukseen! Vastaathan kaikkiin kysymyksiin käytössä olevien Blackboard-kurssiesi näkökulmasta. Kyselyyn vastaamiseen kuluu aikaa noin 5-10 minuuttia. Huomioithan, että tähdellä merkittyihin kysymyksiin vastaaminen on pakollista. **Vastaathan viimeistään perjantaina 28.11.2008.** Kysymyskohtaisia tarkennuksia ja vastausohjeita löydät ? -kuvakkeen alta kysymysten yhteydestä!

Kartoituksesta vastaa opetusteknologiakeskus. Lisätietoja ja ohjeistusta saat tarvittaessa Mari Jussilalta.

VASTAAJAN TAUSTATIEDOT

* Etu- ja sukunimi ?
* Tiedekunta --Valitse tästä--
* Laitos / yksikkö

Työnimike

* Sähköpostiosoite ? @helsinki.fi

Kuinka monella **käytössä olevalla Blackboard-kurssilla olet opettajana** tai suunnittelijana ?

Kurssiesi lukumäärä
- 1-4
- 5-9
- 10-19
- yli 20

KOKEMUKSET BLACKBOARDIN HYÖDYNTÄMISESTÄ OPETUKSESSA

Tällä sivulla valitsemasi vastaukset vaikuttavat seuraavilla sivuilla näkyvään kysymysvalikoimaan. Arvioinneista (testit, tentit, kyselyt), ryhmänhallinnasta ja opintokirjasta on tarkentavia kysymyksiä vain niille vastaajille, jotka ovat työkaluja hyödyntäneet.

Minulla on kokemusta seuraavista Blackboardin **sisältötyökaluista:**

	Kyllä	Ei
Arvioinnit / Assessments ?	○	○
Chat	○	○
Keskustelut / Discussions	○	○
Oppimismoduulit / Learning Modules ?	○	○
Tehtävät / Assignments ?	○	○

Minulla on kokemusta seuraavista Blackboardin **suunnittelijan ja opettajan työkaluista tai toiminnoista** ?

	Kyllä	Ei
Arvostelulomakkeet / Grading Forms ?	○	○
Arvioinnin hallinta / Assessment Manager ?	○	○
Opintokirja / Grade Book ?	○	○
Ryhmänhallinta / Group Manager ?	○	○
Seuranta / Tracking ?	○	○
Tavoitteet / Goals ?	○	○
Tehtävälaatikko / Assignment Dropbox ?	○	○
Valikoiva julkaisu / Selective Release ?	○	○
Lisää tiedosto / Add File ?	○	○

ARVIOINNIT-TYÖKALUA KOSKEVAT TARKENTAVAT KYSYMYKSET

Kuinka monta Arvioinnit-työkalulla luotua **kysymystä** on käytössäsi ?

Kysymysten määrä
- 1-19
- 20-49
- 50-99
- 100-199
- 200-499
- 500-999
- yli 1000

Kuinka monta Arvioinnit-työkalulla luotua **kyselyä, tenttiä tai testiä** on käytössäsi ?

Arviointien määrä
- 1-4
- 5-9
- 10-19
- 20-29
- yli 30

Kerro lyhyesti, mitkä Blackboardin arviointien (kyselyjen, tenttien tai testien) ominaisuudet ovat sinulle keskeisimpiä.

Kerro lyhyesti, mitkä ovat mielestäsi Blackboardin arviointien (kyselyjen, tenttien tai testien) pahimmat puutteet.

OPINTOKIRJAA KOSKEVAT TARKENTAVAT KYSYMYKSET

Minulla on kokemusta seuraavista Blackboardin **opintokirjan ominaisuuksista** ?

	Kyllä	Ei
Keskustelujen arviointi ?	○	○
Lasketut sarakkeet ?	○	○
Arvosanojen hallinta ?	○	○
Käyttäjänhallinta ?	○	○

Kerro lyhyesti, mitkä Blackboardin opintokirjan ominaisuudet ovat sinulle keskeisimpiä.

Kerro lyhyesti, mitkä ovat mielestäsi Blackboardin opintokirjan pahimmat puutteet.

RYHMÄNHALLINTAA KOSKEVAT TARKENTAVAT KYSYMYKSET

Minulla on kokemusta seuraavista Blackboardin **ryhmänhallinnan ominaisuuksista:**

	Kyllä	Ei
Mukautetut ryhmät ?	○	○
Tyhjät ryhmät ?	○	○
Ilmoittautumislomake ?	○	○
Ryhmätoimintojen luonti ?	○	○

Kerro lyhyesti, mitkä Blackboardin ryhmänhallinnan ominaisuudet ovat sinulle keskeisimpiä.

Kerro lyhyesti, mitkä ovat mielestäsi Blackboardin ryhmänhallinnan pahimmat puutteet.

BLACKBOARDIN KESKEISIMMÄT OMINAISUUDET JA HAASTEET

Mitkä käyttämistäsi Blackboardin työkaluista tai toiminnoista ovat **opetuksesi kannalta keskeisimmät**? Mitkä ominaisuudet tekevät niistä ehdottoman tärkeitä?

Millaisia haasteita arvelet syntyvän Blackboardista luopumisessa? Mainitse **kolme itsellesi keskeisintä haastetta!**

1. haaste
2. haaste
3. haaste

VERKKO-OPETUKSEN TYÖVÄLINEIDEN HYÖDYNTÄMINEN JA TUKIPALVELUN KARTOITTAMINEN

Mitä seuraavista opetusteknologia-palveluista hyödynnät tällä hetkellä työssäsi Blackboardin lisäksi?

- ☐ Moodle
- ☐ Wiki
- ☐ BSCW
- ☐ E-lomake
- ☐ ApuMatti
- ☐ En hyödynnä muita opetusteknologia-palveluja

Jokin muu opetusteknologia-palvelu tai verkko-opetuksen työväline kuin edellä mainitut, mikä?

Mikä keskitetyistä opetusteknologia-palveluista sopisi mielestäsi parhaiten opetuksesi toteuttamiseen Blackboardin jälkeen ?

- ☐ **Moodle**, ks. tarkemmin esittely
- ☐ **Wiki**, ks. tarkemmin esittely
- ☐ **BSCW**, ks. tarkemmin esittely
- ☐ **E-lomake**, ks. tarkemmin esittely
- ☐ **ApuMatti**, ks. tarkemmin esittely
- ☐ En osaa sanoa

Jokin muu opetusteknologia-palvelu tai verkko-opetuksen työväline kuin edellä mainitut, mikä?

Mitkä olemassa olevista sisällöistä **aiot siirtää Blackboardista yllä mainitsemaasi opetusteknologia-palveluun** ?

Millaista tukea arvelet tarvitsevasi **opetuksesi rakentamisessa uuteen opetusteknologia-palveluun**?
Vastaa sen palvelun/työkalun näkökulmasta, jota tulevaisuudessa ensisijaisti hyödynnät (yllä mainituista vaihtoehdoista) ?

	En lainkaan	Kerran	Muutamia kertoja	Toistuvasti	Tarkenna halutessasi
Palvelun pikaesittely tai tietoisku (1-2 h)	○	○	○	○	
Työpaja & käytännön harjoittelua (3-4 h)	○	○	○	○	
Laaja peruskurssi sisältäen tietoiskun & työpajan (9-12 h)	○	○	○	○	
Syventävä kurssi & edistyneet ominaisuudet (3-6 h)	○	○	○	○	
Pienryhmälle räätälöity ohjaustuokio (2-6 h)	○	○	○	○	
Lähituki omassa yksikössä (laitos / tdk)	○	○	○	○	
Sähköpostikonsultaatio tai puhelinneuvonta	○	○	○	○	
Monipuolinen tukimateriaali (ohjeet, videoidut tutoriaalit)	○	○	○	○	

Jokin muu tukimuoto kuin edellä mainitut, mikä?

Onko sinulla jotain muuta **lisättävää, kommentoitavaa, kysyttävää** tähän kyselyyn liittyen?

TIETOJEN LÄHETYS

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Survey 3: Questionnaire 4 (Blackboard)

Blackboardista luovutaan

TAUSTATIEDOT

Helsingin yliopiston tietohallintolinjauksen mukaan yliopistolla tullaan luopumaan kahden rinnakkaisen verkko-oppimisympäristön ylläpidosta. Tämän takia Blackboardista luovutaan vuonna 2011 ja Moodlesta tulee ainoa keskitetysti tuettu järjestelmä.

Tällä kyselyllä kartoitan teidän Blackboardia käyttävien opettajien ja suunnittelijoiden suunnitelmia ja tarpeita; milloin aiotte vaihtaa muihin järjestelmiin ja minkälaista tukea arvelette tarvitsevanne. Kyselyn tulosten perusteella valmistelemme opetusteknologiakeskuksessa tulevan vuoden koulutusta ja muuta tukea teidän tarpeitanne vastaaviksi. Olen iloinen kaikista vastauksista! Minuun saa myös mielellään ottaa yhteyttä kaikissa järjestelmän vaihtoon liittyvissä asioissa.

Kysely on vaiheistettu sopimaan vastaajien erilaisille tavoitteille. Sitä varten kahdessa kohdassa lomaketta kysytään vastaajan tarpeista. Vastaamiseen kuluva aika on siis pyritty pitämään mahdollisimman lyhyenä ja vastaajalle hyödyllisenä.

t. *Anni*

Anni Rytkönen, verkkopedagogiikan asiantuntija, opetusteknologiakeskus, anni.rytkonen@helsinki.fi

* Tiedekunta --Valitse tästä--

* Laitos

* Nimi

* Sähköposti (automaattisen kuittausviestin lähettämistä varten)

☑ Haluan liittyä postituslistalle, jossa tiedotetaan Blackboardista luopumisesta

Seuraavaan kysymykseen vastauksen perusteella lomake päivittyy. Jos vastaat

- KYLLÄ, sinulta kysytään Blackboard-kurssiesi tilanteesta ja jatkosuunnitelmistasi
- EI, sinulta kysytään jatkosuunnitelmistasi.

Huomaathan, että Blackboardissa olevien sisältöjen huolehtiminen talteen tai muuhun järjestelmään edelleen käyttöön on opettajan omalla vastuulla. Ohjeita ja tukea tähän on tarjolla, kun tuen tarve ensin ilmaistaan. Ylläpito ei automaattisesti siirrä mitään. Blackboardin poistuessa käytöstä 2011 siellä oleviin sisältöihin ei enää pääse käsiksi.

Opetussisällöt Blackboardissa

* Minulla
- ○ ON Blackboardissa opetukseeni liittyviä jaksoja
- ○ EI ole Blackboardissa sellaista materiaalia, jota haluan muualle käyttöön

KURSSIT BLACKBOARDISSA

Blackboardissa kurssialue on hallinnollinen taso, jonka alla on varsinainen opetus ja opiskelua jaksoina. Tässä kysytään nimenomaan jaksojen lukumäärää.

Blackboardissa olevat jaksoni ovat:

	0	1	2-3	4-n	Lisätietoja (esim. lukumäärä, milloin opetus päättyy, mitä tarvitaan/ei enää tarvita)
käynnissä olevia eli syksyn 2009 opetusta	○	○	○	○	
tulevaa, kevään 2010 opetusta	○	○	○	○	
tulevaa, syksyn 2010 opetusta	○	○	○	○	
jaksoja, joita ei enää käytetä opetuksessa	○	○	○	○	
harjoittelualueita	○	○	○	○	

Blackboard-jaksoistani koen olevan

	0	1	2-3	4-n	Lisätietoja tarvittaessa
• yksinkertaisia toteutuksia/sisällöltään melko pieniä tai suoraviivaisia	○	○	○	○	
• sisältävät paljon tai suuria tiedostoja	○	○	○	○	
• sisältää monimutkaisia tenttejä tai muita haastavia rakenteita	○	○	○	○	

Tarkennusta ja kommentteja Blackboard-jaksojen sisältöihin.

JATKOSUUNNITELMAT

Jaksot Blackboardissa, joilla olen opettajana tai suunnittelijana:

• Mitä Blackboard-jaksoilleni tehdään:
○ Mitään EI saa vielä poistaa!
○ Minun puolestani jaksot SAA poistaa (monen opettajan kursseilla varmistettava muiltakin)

Vahvista vapaamuotoisella ilmoituksella

Seuraavan kysymyksen perusteella lomake päivittyy. Jos vastaat

- MOODLE, sinulta kysytään oppimisympäristön vaihdon tuki- ja koulutustarpeistasi ja -toiveistasi
- MUU tai EN MITÄÄN, kysely päättyy; kiitos vastauksestasi!

Huomaathan, että Blackboardissa olevien sisältöjen huolehtiminen talteen tai muuhun järjestelmään edelleen käyttöön on opettajan omalla vastuulla. Ohjeita ja tukea tähän on tarjolla, kun tuen tarve ensin ilmaistaan. Ylläpito ei automaattisesti siirrä mitään. Blackboardin poistuessa käytöstä 2011 siellä oleviin sisältöihin ei enää pääse käsiksi.

Olen jatkossa ajatellut hyödyntää (Blackboardin tilalla)

yliopiston järjestelmistä
○ Moodlea
○ Jotain muuta, mitä?
○ En mitään

Perusteluja, tarvittaessa

Vapaita kommentteja

VAIHTO BLACKBOARDISTA MOODLEEN

Vaihdon ajoituksella tarkoitan tässä aikaa siitä, kun aloitat Moodleen tutustumisen eli osallistut kurssille tai muokkaat ensimmäistä kurssialuettasi ja pidät ensimmäisen kurssisi Moodlen kautta, siihen asti, kun et enää tarvitse Blackboardissa olevia kurssejasi enää mihinkään.

Vaihtoon käytettävä ajanjakso kannattaa olla mieluummin kuukausissa kuin vuosissa laskettavaa aikaa. Monet opettajat ovat opetelleet Moodlen ja kokeilleet siinä opettamista ensin yhdellä kurssilla ja ennen seuraavaa lukukautta ottaneet Moodlen käyttöön muillakin kursseillaan. Moodleen tutustuminen ja ensimmäisen kurssialueen rakentaminen kannattaa siksi aloittaa ajoissa.

Olen suunnitellut vaihtavani Blackboardista Moodleen tällaisella aikataululla (kuukaudet/vuosi)

	Tehty	12/09-01/2010	01-02/2010	03-04/2010	05-06/2010	08/2010	09-10/2010	11-12/2010	Tarkennusta
• Aloitan	○	○	○	○	○	○	○	○	
• Olen valmis	○	○	○	○	○	○	○	○	

Vaihtaessani olen jo tehyt näin:

- ☐ Hyödynsin Opettajan opasta verkossa
- ☐ Osallistuin opetusteknologiakeskuksen järjestämään koulutukseen Moodlen opetuskäytöstä, 1-2 iltapäivää
- ☐ Tarvitsin teknistä siirtoapua vaikeisiin sisältöihin (tentit)
- ☐ Otin yhteyttä omaan verkko-opetuksen tukihenkilööni, joka neuvoi minua
- ☐ Kysyin neuvoa sähköpostitse osoitteesta atk-oppimisymparistot@helsinki.fi
- ☐ Koen selvinneeni itsekseni
- ☐ Muuta, mitä? Tarkenna alla.

Tarkennusta edelliseen kysymykseen:

Olen vielä ajatellut tehdä näin:

- ☐ Hyödynnän Opettajan opasta verkossa
- ☐ Osallistun opetusteknologiakeskuksen järjestämään koulutukseen Moodlen opetuskäytöstä, 1-2 iltapäivää
- ☐ Osallistun verkkopedagogiikan koulutukseen
- ☐ Osallistun mieluiten koulutukseen omalla kampuksellani
- ☐ Otan yhteyttä omaan verkko-opetuksen tukihenkilööni
- ☐ Toivon koulutuksen jälkeistä työpajaa, jossa saan rakentaa kurssialuettani omassa tahdissa
- ☐ Toivon jatkokoulutusta Moodlen laajojen kokonaisuuksien (oppitunti, tentti, arviointikirja) opetuskäyttöön
- ☐ Tarvitsen teknistä apua tenttien siirtämiseen
- ☐ Kysyn neuvoa sähköpostitse osoitteesta atk-oppimisymparistot@helsinki.fi
- ☐ En tarvitse koulutusta, osaan riittävästi ja koen selviäväni itsekseni
- ☐ Muuta, mitä? Tarkenna alla.

Tarkennusta edelliseen kysymykseen:

Osallistun mielelläni Moodle-peruskoulutukseen, jolle sopivia ajankohtia ovat

- ☐ joulukuussa 2009 2. periodin aikana
- ☐ joulukuussa 2009 opetuksen päätyttyä, ennen joulua
- ☐ tammikuussa 2010 ennen opetuksen alkua
- ☐ keväällä 2010 3. periodin aikana
- ☐ keväällä 2010 3. ja 4. periodin väliviikolla
- ☐ keväällä 2010 4. periodin aikana
- ☐ 4. periodin jälkeen toukokuussa 2010
- ☐ kesäkuussa 2010
- ☐ elokuussa 2010

Minulla on jo Moodlessa kurssialueita:

	0	1	2-3	vastaten tarpeitani	Lisätietoja, kuten tarkempia lukumääriä
harjoittelualueita	○	○	○	○	
käynnissä olevaa opetusta	○	○	○	○	
tulevaa, kevään 2010 opetusta varten	○	○	○	○	
tulevaa, syksyn 2010 opetusta varten	○	○	○	○	

Tarkennusta ja kommentteja Moodle-kurssialueiden sisältöihin.

Blackboardissa olevat kurssijaksot, joiden sisältöjen muokkaamisessa Moodleen sopiviksi tarvitsen teknistä apua:

Tarkennusta ja kommentteja suunnitelmiini

Kiitos vastauksestasi!

TIETOJEN LÄHETYS

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Appendix C: Interview themes and note

General themes presented; supportive questions were asked based on the answers.

Theme 1: User experiences

- Overall experience on web-based learning environments and other systems used in teaching with students (or assisted colleagues to use)
- The systems in use at the moment with motivations

Theme 2: Goals

- The goals in selecting educational technology for courses
- Comparison of practical differences between when creating course areas in Blackboard and Moodle

Theme 3: The impact on working methods that the selected systems provide

- Perceived teacher methods/opportunities for supporting students in the web-based learning environment
- Methods provided by the system for supporting students and steering student workflow. These are compared in different systems.
- When students use the web-based learning environment, they either proceed as designed or do something else. Comparison of a) teacher-based and b) system-based reasons for this.
- System support in the teacher workflow in Blackboard and Moodle in a) designing the course area, b) working with students, and c) assessment.

Theme 4: Values and overall evaluation

- Comparison of Blackboard, wiki, and Moodle (eventually other systems as well, depending on what systems the respondent had used): value provided by the systems
- Perceived best system above others, with explanations
- The migration costs and benefits of moving from Blackboard to Moodle (those who had migrated) and the overall results
- Three wishes concerning web-based learning environments
- Additional questions and contact needs

NOTE

I want to compare:

a) Corresponding implementations in Blackboard and Moodle
b) Alternative implementation options within the web-based learning environment
c) Goals that you manage to reach with the systems
d) General ideas and perceptions on the systems